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What Yields Do You Want? ..... *Capper's Farmer* 1
Cows Are Capable Soil Chemists ..... *Guernsey Breeders Journal* 7
Marketing—The No. 1 Project ..... *Rural New Yorker* 12
What Kinds . . . How Much Livestock? ..... *Iowa Farm Science* 16
Blizzards Emphasize Wisdom of Windbreaks ..... *Western Farm Life* 21
Use These New Fly Killers ..... *Farm Journal* 25
More Summer Eggs ..... *Poultry Tribune* 28
Organic Farm Power ..... *Archer P. Whallon* 31
Highbush Blueberries ..... *Farm Research* 35
More Buyers Mean Profits with Purebreds ..... *Ohio Farmer* 37
The Secret of the Maple ..... *New England Homestead* 40
How to Manage Orchard Soils ..... *American Fruit Grower* 43
Curing Hay in the Stack ..... *Rural Electrification News* 47
Commercial Broiler Production ..... *American Poultry Journal* 53
Ramie's Debut ..... *Wall Street Journal* 57
Sheep Get Buzz Bombed ..... *California Farmer* 62
Firewood, the Orphan Fuel ..... *Home Desirable* 63
The Cost of Not Using Lime ..... *Michigan Farmer* 65
Mixed Hay Cuts Cost for Sheep ..... *Dakota Farmer* 68
Push a Button . . . Hens Are Fed ..... *Successful Farming* 71
The Story of Copper ..... *Fertilizer Review* 71
Kentucky 31 Fescue ..... *Kentucky Farmer* 74
Right Temperature Makes Corn Yield ..... *Eastern States Cooperator* 77
Chlordane for Control of Hog Mange ..... *Hog Breeder* 79
Care of the Milking Machine ..... *American Agriculturist* 80
The Need for Feeder Type ..... *Shorthorn World* 84
Strength of Electric Wires ..... *Electricity on the Farm* 88
Experiments with Nut Trees ..... *Pennsylvania Farmer* 89
Weather—What Is Done About It ..... *Kansas Farmer* 92
Crushing Hay Cuts Curing Time ..... *Capper's Farmer* 94
Index 95

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The Farmer's Digest

Volume 13 July, 1949 Number 3

What Yields Do You Want?

Condensed from Capper's Farmer

M. N. Beeler

Now you can set a crop-yield goal and make it. You can have just about any bushelage or tonnage an acre within reason. If you are satisfied with what you are getting, you can freeze production on that level. If you need a boost, you can aim for 100 per cent of the possibility for your conditions. You don't need to wish for high yields. You can have them.

This choice is made possible by a simple, sensible system of fertility build-up and upkeep. It was put together by Dr. R. H. Bray, Illinois soils man, so that anybody who wanted to balance fertility and insure his crop yields could help himself.

Making a crop is like putting up a building. Certain materials are needed in either case. And there must be enough of them for the size of job. You can't build a 10-room house with the lumber for a 5-room house. And you can't make a 100-bushel yield out of the fertility for a 50-bushel yield.

The Bray system tells what plant foods are short in the soil, how much fertilizer should be added and where it should be put. It tells what applications are required to build up to the yield goal, and what must be done to keep up that production.

The Bray system means testing. It's not safe to guess. The old shotgun method of putting on 75 pounds an acre of this or 250 pounds of that may do the job, but it is just as likely to be wrong as right. Testing requires a little time and trouble taking samples, and it will cost something to have determinations made, but it will save money in the long run.

The most common shortages, of course, are organic matter (or humus), nitrogen, lime, phosphate and potash. They are limiting crop yields all over the country. For 4 of the big 5, quick tests have been worked out. In case of lime, phosphorus and potash, the state

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agricultural college or the county laboratory can tell how many pounds of each are needed to bring fertility up. The tissue test for nitrogen just indicates whether the growing plant is getting enough of that element, but doesn't specify the amount in the soil or how much should be applied.

There is no easy way to determine organic matter, but most soils will benefit from all that can be added by green manure, animal manure and crop residues.

"By testing your soil," said Doctor Bray, "we can tell what is needed, where it is needed and how much is needed. Also we can just about predict what the yield will be if you do nothing, and what the increase will be if you apply either phosphate or potash or both.

"Recommended applications of lime, phosphate and potash will put them all in proper balance. Whether nitrogen will be in balance will depend on how good a rotation and legume program is followed, how much manure is returned and how much commercial nitrogen is plowed under."

The first step is to test. The report will put your land in one of 3 classes: The fertility will be deficient, just about right or there may be a surplus.

1. A soil that is deficient in fertility has less than 150 pounds of potash an acre, it is low to medium in phosphorus and needs 2 to 5 tons of limestone an acre. Most soils are short in 1 or more of these main plant foods. Some lack all of them. These shortages must be corrected before top yields can be made.

2. A soil that is just about right in fertility has 150 to 200 pounds potash an acre, it is medium to high in phosphorus and needs 1 ton or less of limestone an acre. Such land will produce top yields, but must receive some lime, phosphorus, potash, nitrogen and organic matter to hold the high level of crop production.

3. A soil that has a surplus of fertility contains more than 200 pounds of potash an acre, it is high in phosphate and needs no limestone. Not many soils are in this class. Such land may be farmed without fertilizers until the extra fertility is cropped out. Treatments to increase or maintain a surplus are likely to be wasteful. The only way to avoid that expense is to test every 6 to 8 years.

The Bray system is divided into 2 parts—build-up and upkeep. After the soil test, there are 3 steps in the build-up.

1. Applying limestone, phosphorus, potash and other plant foods in amounts called for by the soil tests.

2. Establishing a good crop rotation, including legumes for green manure.

3. Returning crop residues and animal manures to the soil.

None of the build-up steps can be slighted. Remember also that the fertilizers and organic matter must be added in greater amounts than are removed by crops, leaching and erosion. If you put in just what is taken out, yields will hold at the present level. If you put in less than is taken out, yields will decline.

The extra plant food must accumulate until there is enough to support the yields you want. We know how much fertility is required to make certain yields. To produce 100 bushels of corn, for instance, Doctor Bray says the soil must deliver 150 pounds of nitrogen, 23 pounds of phosphorus, 72 pounds of potassium and 5 million pounds of water. In addition there must be enough organic matter to release the nitrogen and store the water.

If an acre can deliver only half of these amounts, you'll get about 50 bushels of corn. If it can deliver all of the amounts, you'll get pretty close to 100 bushels.

Lime, phosphorus and potash can be stored in the soil. Amounts needed to bring yields up to the goal can be added in one shot, if you've got the ready cash. Or the build-up can be spread over several years, say 2 or more rotations.

Nitrogen can't be stored in the soil for very long, but the ability of land to deliver it can be built up. Also nobody is likely to get enough organic matter in 1 application. It must be built up, too.

Now suppose you choose the slow build-up. You apply the limestone required by test, so you can grow clovers. Legumes turned under and animal manures will take care of the organic matter and most of the nitrogen. But you can't guess that they will. So you make the tissue test for nitrogen during the growing season.

Since commercial nitrogen can't be stored from year to year, it must be applied as the ground is plowed, as the crop is planted or as a top- or side-dressing. The phosphorus and potash can be applied year by year, or once in a rotation, which is less trouble.

The soil laboratory will report the amount of phosphorus as Low, Slight, Medium or Heavy. And there may be a further division in each class, such as Low (minus), Low (plus); Slight (minus), Slight (plus) and so on.

With low phosphorus you can expect 62 to 80 per cent of a top yield. To get 100 per cent, you'll need to apply 390 to 500 pounds of superphosphate or 1,200 to 1,500 pounds of rock phosphate an acre in a 4-year rotation.

With slight phosphorus you can expect 85 to 92 per cent of a top yield. To get 100 per cent, apply 240 to 340 pounds of superphosphate or 800 to 1,000 pounds rock phosphate an acre in the rotation.

With medium phosphorus you can expect 96 per cent or more of a top yield. To get 100 per cent, apply 70 to 120 pounds of superphosphate in the rotation.

With high phosphorus, no buildup is required, so the program shifts immediately to upkeep. Amount required for upkeep may vary from 280 to 400 pounds of superphosphate an acre every 4 years, depending on yields removed and management practices.

The laboratory will report potash in pounds an acre. With 40 pounds available potassium, you can expect 53 per cent of a top yield. To get 100 per cent, apply 420 pounds muriate of potash an acre in a 4-year rotation. With 50 pounds available, the yield expected would be 61 per cent; the application for 100 per cent would be 400 pounds in the rotation.

With every jump of 10 pounds available potassium an acre the yield percentage goes up and the application required goes down. With 130 to 150 pounds available, the yield possibility goes to 91 or 94 per cent and the application drops to 200 or 150 pounds. From 170 to 300 pounds of available, the program goes on maintenance which requires 90 to 240 pounds of muriate of potash for a 4-year rotation, depending on yields removed and management practices.

After either the quick or slow build-up, you switch to maintenance or upkeep. In this part of the program, you apply the fertilizers and organic matter required to replace the fertility removed by cropping, leaching and erosion.

Doctor Bray and S. W. Melsted have outlined the steps in upkeep:

1. Growing legumes. Legumes are specified in the rotation to fix nitrogen, add soil organic matter, improve soil tilth and make conditions good for soil organisms. A 2-ton crop of mixed clovers plowed under will increase soil nitrogen by about 100 pounds an acre. This is barely enough to produce a single 100-bushel corn yield. If the 4-year rotation includes 1 legume crop, or a legume catch-crop and a soybean crop, it cannot supply all the nitrogen needed. So the legume system must be supplemented by mineral nitrogen or manure or both for maintenance.

2. Applying manure. Altho livestock farming always has been considered least destructive of fertility, it will not generally maintain top productivity of every acre. The only exceptions are where extra feeds are brought to the farm and where extra legume crops are grown in the rotation.

Even when all crops are fed and manure is returned to the land, a big portion of the fertility is lost. A fourth of the nitrogen, a fifth of the phosphorus and a tenth of the potassium in feed is

retained by the animal. A third of all nutrients in manure is lost thru improper handling. So only 50 per cent of the nitrogen, 53 per cent of the phosphorus and 60 per cent of the potassium that were in the feed ever gets back to the land.

Still manure is one of the best sources of plant food. Ten tons of it carefully handled will supply nutrients equal to 500 pounds ammonium nitrate, 230 pounds 20 per cent phosphate, and 192 pounds potassium chloride.

3. Adding organic matter. Structure and stability of a soil, as well as tilth, aeration and water-holding capacity depend largely on its organic matter. Present practices do not maintain this vital factor of fertility. Nor will the ordinary 4-year rotation do it.

Soil organic matter contains about 5 per cent nitrogen, 1 per cent phosphorus and 1 per cent sulfur. Without nitrogen, the crop residues break down and do not form soil organic matter. To maintain soil organic matter, as much nitrogen must be added as is removed in crops or lost thru leaching. To increase it, more nitrogen must be returned than is removed.

Soil organic matter is not being maintained under present practices. It is being destroyed in the release of nitrogen required to produce crops. Growing legumes, and turning under part of them, adding manure and fertilizers containing mineral nitrogen all are necessary to maintain soil organic matter.

4. Supplying minerals. The mineral plant foods required for maintenance are applied in the form of soluble materials which will go into the natural available forms in the soil. Bray and Melsted worked out the amounts of nitrogen, phosphorus and potassium required to maintain fertility for making 100 bushels of corn an acre. Equivalent yields of other crops are 70 bushels of oats, 35 of wheat, 32 of soybeans and 3 tons of legume hay.

They list 8 rotations, ranging from 3 to 8 years, under 3 different systems of farming. In the first, called the Grain System, all grain, straw, stover and 2 legume cuttings are removed. No residues are returned.

In the second, called the Grain-Residue System, grains and 1 legume cutting are removed, but residues are returned. In the third, called the Grain-Livestock System, grains and 1 legume cutting are removed, and both residues and manure are returned.

In none of the 8 rotations under the 3 systems of farming are the phosphorus and potash maintained. In only 4 of the rotations under one of the systems, Grain-Livestock, is the nitrogen maintained. These rotations are: (1) A 3-year round of corn, oats, legume,

in which the nitrogen gain is 11 pounds an acre. (2) A 3-year round of corn, soybeans, oats with a legume catchcrop turned under, with 19 pounds nitrogen gain. (3) A 4-year round of corn, soybeans, corn, oats with a legume, catchcrop plowed under, in which there is a gain of 3 pounds nitrogen an acre. (4) An 8-year round of corn, soybeans, oats with legume catchcrop, corn, soybeans, oats, 2 years alfalfa, in which the nitrogen gain is 30 pounds an acre. Remember these gains are made only where all crops and forages are fed, residues and manure returned to the land. In no other case is there a gain in nitrogen.

Biggest shortages occur in the Grain System under all rotations. To balance the nitrogen, yearly applications would range from 57 pounds an acre for the 8-year rotation to 116 pounds for a corn, corn, soybean rotation. Phosphorus maintenance would require yearly applications of 36 to 48 pounds an acre under the 8 different rotations; and potash, 73 to 84 pounds.

Under the Grain-Residue System nitrogen balance in the various rotations would require 16 to 61 pounds; phosphorus, 27 to 34 pounds, and potash, 18 to 37 pounds an acre.

Under the Grain-Livestock System, the 4 remaining rotations which require added nitrogen to balance outgo, the shortages range from 2 to 16 pounds an acre. Phosphorus shortages for the 8 rotations under this system range from 12 to 16 pounds and potash from 7 to 15 pounds an acre.

Biggest drain on land from harvested crops is in the Grain System. Total dry matter, exclusive of roots, removed from land varies from 7,400 to 10,300 pounds an acre, depending on the rotation. Under the Grain-Residue System, about half the harvest is returned. Amounts range from 3,700 to 5,900 pounds an acre. Under the Grain-Livestock System, all grains and legumes are fed, manure and residues returned which means little dry matter loss.

Bray and Melsted say the calcium and magnesium needed for maintenance are met when the land is limed. Soils that are low in magnesium should be treated with dolomitic limestone.

After the maintenance program has been under way a while, the soil should be tested again to see if fertility input is meeting the outgo. Rechecks should be made every 6 to 8 years.

Making a crop is like putting up a building. You've got to have the right materials in the right amounts to do either job.

Cows Are Capable Soil Chemists

Condensed from Guernsey Breeders Journal

Dr. William A. Albrecht
Department of Soils, University of Missouri

We are coming to realize that the cow, like other animals, is endowed with some uncanny capacities for selecting her feeds. When she selects some plant family, like the clover, and takes it completely, while another, like the broom-sedge, is disregarded and allowed to grow tall and remain through the winter as proof of its worthlessness as feed, she is demonstrating her capacity as a capable chemist. She is reporting her recognition, not only of the high nutritional values of one plant species in contrast to the low values of the other, but also of the difference in the creative services in terms of feed and food by the soils under these plants. We have been slow to recognize the cow as a chemist analyzing the soil. Her capacity in analyzing what she takes into her body, and in synthesizing what she puts out, deserves our appreciation of her endowment with chemical refinements that science does not yet duplicate.

One needs only to look at history to realize that the survival of the nomad in his primitive agriculture depended on the fact that the cow went ahead of the plow. She was leading the people wherever their agriculture went. She inspected the natural forages, delineated the areas of fertile soils, and marked them out as being fitted to grow food for her owner as well as for herself. Agriculture of the Old World put the plow where the cow had first gone to recommend that it be put there, and has long endured because it sent this capable chemist ahead to scout the areas.

Quite the reverse is the case in our American agriculture. On much of our arable land area, the plow went ahead of the cow. We used no such capable chemist, to put the stamp of approval on the fertility of the soil as a suitable and enduring food creator for both the cow and ourselves. We are now coming gradually to see that (a) in our problems of protein feed supplements, (b) in the irregularities in conception and (c) in the failures in calving, there are suggestions that the soils may be deficient in items to which we have not yet given sufficient nu-

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tritional significance.

It has taken us a long time to learn that when a plant makes bulk, such a performance is not proof that it is making food. The cow has long exhibited her recognition of this great truth. She has regularly refused to take the tall grass marking the spot of her droppings. Yet, she was eating shorter the short grass around it. We were prone to believe her fastidious about getting in contact with her own voidings. But, if we can take a suggestion from some feeding trials with rabbits, she was trying to tell us that too much nitrogen as a fertilizer makes a grass which she, as a nutritionist, cannot approve for her own consumption. She was corroborating what the livery horses told their New England owners, who refused to buy hay fertilized with only Chile salt peter, or sodium nitrate.

In some fertilizer trials on pastures at the Missouri Experiment Station, various fertilizers were used. Where only nitrogen was applied and the tall, luscious, green grass was made into hay for feeding trials with rabbits, they were reluctant to take it except under approach to starvation. Their loss in weight and their discard of the hay from the feed rack, to use it only for bedding, were ample suggestions from the rabbit behavior that the cow's refusal was a vote of agreement with the rabbit as chemist. "Too much nitrogen," both were saying, with one of them referring to fertilizer and the other to the urine in one spot. Both were capable analysts. But, we had not recognized that as such they were making an unfavorable report on the quality of the feeds, according to the unbalanced fertility of the soil.

Even though we have put the plow ahead of the cow, she is now coming along behind it to report how successful we are in fertilizing the soils to grow feeds satisfactory for her. She selects certain pasture areas, given different fertilizer treatments, that are coming to be the guide for many Missouri farmers as to how their soils should be treated. They are using not only laboratory test tubes on the soil to direct their fertilizer practices, but are also asking for the cow's assay of the forages according to her preferred choice of some fertilized areas over others.

Lime has long been used on Missouri soils because the cow, serving as a capable chemist, recommended it by her choice of it as preferred grazing. Now that much of the land has been limed, the treatment of the soil with potash is the cow's first choice, and tells us of the soil's need for more than only lime. She has been grazing the phosphated soils as first choice for some time, but since this soil treatment adds calcium, sulfur, magnesium, and a host of trace elements, we have thought she was

analyzing for phosphorus. She may have been pointing out the effects of the trace elements, and other "contaminants" so common in superphosphate, which we, ourselves, do not yet consider as widespread, deficiencies in the feed, much less in the soil growing it. The cow is guiding our fertilizer practices even with respect to the trace elements.

To believe that the cow is a chemist capable enough to be pointing out the single inorganic elements, as we do in burning or "ashing" the forage and making analyses for the separate chemical elements, may be crediting her through an excessive stretch of our imagination. She is probably indicating the presence, not of the separate inorganic or mineral fractions, but rather of organic compounds and complexes synthesized by the help of these mineral agencies coming from the soil.

That these are the probable facts is suggested by tests with hogs that selected, ahead of the corn, the different corn grains from the different compartments of the self-feeder representing plots with different treatments. The plots in one series were given increasing combinations of different fertilizers, and grown with sweet clover as a green manure plowed under ahead of the corn. In another series, the same fertilizer treatments were used for sweet clover grown for a seed crop, with corn following the next year. Choices by the hogs of the corn grain, in the latter case, gave the higher percentage consumption according to the amount of fertilizers used on the soils growing it. In the former case, the order of consumption was exactly reversed. Here is the suggestion that the grain consumed is not chosen in direct relation to the inorganic elements of the fertilizers put on the soil ahead of the corn, but apparently according to the different organic compounds in the green manure, or the dead sweet clover residues plowed into the soil ahead of the corn crop.

Perhaps the cow, in her selection of different herbages, is acting like a biochemist searching out food compounds, and is not "ashing" them to determine their inorganic or mineral contents. Perhaps, when so much of her ration commonly consists of carbohydrates or energy foods, she is searching for the proteins to balance them. Since proteins are usually synthesized more bountifully by forages given inorganic fertilizers, like lime and phosphate on our humid soils, we may be erroneously crediting her as an inorganic chemist searching for, and detecting, only minerals. In reality, she should be more properly credited as an organic chemist, or even as a biochemist, balancing her diet according as the higher level of soil fertility has

elaborated more protein, vitamins, etc., in the plants to make this balancing of it possible. Are we not mistaken, then, in trying to help her out by offering her the lime and phosphate as inorganic compounds in the mineral feed box for direct consumption in these forms?

Since the cow is one of the higher life forms, we may well expect a higher number of different elements and compounds to be required to feed her. Equipped as she is to range over extensive territory, she increases her chances to gather from greater soil areas all the requisites from that source. Then, when she daily takes about 150 pounds of green feed into her paunch for the microbial along with the alimentary digestion, she is synthesizing as well as analyzing many compounds. That synthetic performance is the means whereby she can be fed urea and can synthesize it into protein-like compounds to be digested and absorbed farther on in transit through her digestive canal. It is that means whereby she synthesizes several vitamins, hormones, etc., for her own benefit and for the benefits seemingly recognized long ago by hogs and chickens following her, but only recently recognized by the nutritionists. Through this recognition, dried cow dung has now become a recommended ingredient of the poultry ration on behalf of some "factor" still unknown.

Surely the cow that is a collector of all the requisites for these microbial synthetic performances which are serving her, and passing some benefits on to the hogs and chickens following her for her droppings, must be a capable chemist in her own right. She was this long before we even imagined these highly integrated relations of different life forms, including interdependencies between microbes, plants, pigs, chickens and cows. The art of agriculture has long had the farmer's pigs following the fattening steers. This was a practice decades before these relations were recognized by the science of agriculture, that now prescribes dried cow manure in the ration for chickens, but not yet for hogs. Surely, the art of agriculture is old, but the science is new.

Can it be that the cow, in her range over greater territory and in her support of a greater microbial flora in her rumen, is equipped to gather more completely all the different inorganic elements—including the trace elements—that we, as well as she, needs? Can it be that she is better equipped to synthesize them for nutritional use than any other animal? Is this the reason she can be strictly herbivorous, while hogs and poultry must be fed some animal protein supplement? Did she know that trace elements used

as fertilizers encourage higher concentrations of certain amino acids in alfalfa to make it more nearly a complete protein, as has only recently been reported by the Missouri Experiment Station?

Such questions present themselves very near to their own answer when cobalt—recognized as an essential trace element for cattle—is a constituent of the recently discovered vitamin B_{12}. Such questions prompt themselves when this new red crystalline vitamin, containing this trace element, is considered the animal protein factor, and the lacto bacillus-lactic factor. Is it too much of a stretch of the imagination to consider additional trace elements, like manganese, zinc, copper and others, playing similar significant roles in being parts of certain vitamins, enzymes, hormones and other biochemical tools? Might not they be synthesized somehow by the cow and her intestinal microbial flora living in mutual benefit from such chemical elaborations? When these trace elements are required in only such small amounts, and when their omission from certain biochemical processes suggests some disastrous diseases like Bang's, shall we give them less importance and attention because of their presence in only trace amounts? Perhaps the cow has been more of an analyzing and synthesizing chemist than we recognized. Even if we credit her only as a collector, she has guarded against omission of any of an extensive list of elements, some only recently known and possibly others still unknown to us.

Now that we are learning more chemistry from the cow, the problem of feeding her properly takes on more ramifications. Consideration must be given not only to the bulk and simpler chemical composition of her feed, but also to the fertility of the soil growing it. However, the problem need not be considered so baffling when we condescend to learn more chemistry through the help of the cow herself.

Marketing—The No. 1 Project

Condensed from the Rural New Yorker

Dr. H. B. Tukey
University of Michigan

In this Twentieth Century, the handling and marketing of perishable produce has become the big task confronting the horticultural industry. The farm value of fruits and vegetables for the United States is approximately two and a quarter billions of dollars, while the retail value is approximately 10 billions—four times the farm value. To put it another way, the product on the farm averages 25 cents, while the cost of handling, transporting, and selling is 75 cents.

The orange makes a good case history, and the records of the California Fruit Growers Exchange, which handles 100,000 cars of oranges a year, make a good place to start.

Imagine a consumer in New York City. He bought oranges in 1948 from the retail store at a rate of $6.84 a box. The retailer really served as the purchasing agent for the consumer; he handled the money. Of the $6.84 that he received, he kept $1.77 (25.9 per cent) and paid $5.07 to the jobber from whom he bought the box. The jobber in turn kept 43 cents (6.3 per cent), the railroad kept $1.32 (19.3 per cent), and the fruit exchange in California received the $3.32 (48.5 per cent) which was left. To this point in the narrative, then, it has cost 51.5 cents out of each dollar paid by the consumer to get the fruit to him from the packing shed in California.

The California Fruit Growers Exchange next took 18 cents (2.6 per cent) for selling and advertising the box of oranges. The packing operation took 98 cents (14.3 per cent), the picking and handling operations took 40 cents (5.9 per cent), and the grower got what was left, which means that he received $1.76 (25.7 per cent) for the fruit as it stood on the trees. That is the story of farm commodity after farm commodity in general terms in this year of 1948 just passed.

People who know these facts respond differently. Some are startled. Some are puzzled. Some cry out for a larger share of the consumer's dollar. Some are angry. Some are studying the matter and seeing such things as the advan-

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tage they may have by being close to market or by developing local markets, and this is the most sensible thing to do.

A logical first question to ask in trying to analyze this situation is, "Why must there be this tremendous cost for handling and marketing?" The answer is that it is all wrapped up with our modern civilization, which is identified with specialization. There was a time when all a man had was a dog and a gun. His neighbors helped him put up a house and a barn. He was his own producer, handler, and consumer. Today, production is a specialist's job, to a point where only 15 men are needed back on the land to produce the food needed by themselves and 85 others not on the land. In the Los Angeles area, five per cent of the people are employed in production (three and one-half per cent in agriculture), while 25 per cent are employed in manufacturing, and 70 per cent are employed in distribution and services.

Today, the bulk of the crops are raised on those areas most favorable to their production—citrus in California and the Gulf States, pears in California, apples and winter pears in the Pacific Northwest, potatoes in Idaho and Maine, strawberries in Tennessee and Louisiana, sour cherries in Michigan, and so on. The railroads make big business of this hauling. There are over a million cars of fresh fruit and vegetables that move to market by rail each year—89,000 from Texas, 105,000 from Florida, 56,000 from Maine, 45,000 from Idaho, 312,000 from California, 42,000 from Arizona, 56,000 from Washington, and 22,000 from Oregon. This does not count truck movements.

All this costs money. It costs on the average two to two and a quarter cents a pound to move produce cross country from one coast to the other, and it costs one cent a pound to move it from North to South. Here is where the producer close to market has an enviable advantage. Hauling, packing, refrigeration, icing, switching, unloading, trucking, packaging, local delivery–all carry a charge that someone must pay.

And as one studies the situation, he gets the picture of two great funnels placed end to end, the one funnel reaching out to production and the other reaching to the consumer. Into the large, open end of the production funnel as though sucked up by a giant vacuum sweeper come the oranges, the apples, the grapes, the apricots, the raisins, the carrots, the cabbage, the lettuce, the potatoes, the prunes, the snap beans, the tomatoes, the pears, the peaches, the celery, and the dozens of other items. At each step they are compressed into smaller, more compact units, until finally they

become solid trains of packed boxes running through the narrow end of the funnels to market.

The train approaches the area of consumption. Now the reverse of assembly occurs. The compact units are broken down. One car goes here, another goes there. Each car is broken into separate boxes; in turn each box is broken into "two pounds for 29 cents" or "15 cents a head." Each operation of collecting many small, loose units into large compact ones costs money. At the other end of this line, each step in the breakdown of large compact units into smaller units of consumption costs money. This is modern living.

Then every so often, the fickle consumer, as though not knowing what he wants, suddenly stops buying a specific item. Onions may be cheap, but the customer may not want onions. Carrots may be expensive, but the customer may want carrots. What are the psychological factors that make humans act as they do? Why does a housewife drive to a self-service store, trot all around the place waiting on herself, lugging the packages to her private car, and dragging them all the way home when she she could order the same standard brands by telephone? There are explanations, of course, but they are made in the light of what has happened rather than by way of prophecy of what is to come. Who would have predicted such a change 30 years ago?

It is at this stage of the story that the perishable products attract attention. Those who seem to know say that it is the displays of perishable products — fruits, vegetables, meat, and poultry— that make the modern super markets. They say that these great self-service stores cannot exist without a great variety and display of good perishable merchandise, and that the housewife comes to select perishables and incidentally collects staples. In other words, horticultural products are taking on increasing importance.

A natural question is "What lies ahead?" Will it be pre-packaging at the point of production? Must the more perishable materials like tomatoes be packaged near the consumer, and will the less perishable materials like apples be packaged nearer the points of production? Will freezing and canning operations replace fresh handling? Will a depression, or low purchasing power, sound the death knell to prepackaging as it did in the 1920's?

Can the eating habits of a nation be changed? The 25 million boxes of oranges from California in 1915 became 50 million in 1925, 100 million in 1935, and 200 million in 1945; yet they were moved at a profit. The average American housewife spends 18 cents out of each dollar for fruits

and vegetables, yet nutritionists say it should be 21 cents and that the ideal diet would increase this amount to 23 cents. Sour cherries have increased in production from 70 million pounds to 300 million pounds. Consumption of green and leafy vegetables has increased steadily, while that of apples and potatoes has steadily declined for several decades. What will the future hold? Will advertising help?

These are the variety and complexity of problems that face a great industry. What can the producer do? The first thing he must do is to recognize that he is an important link in the chain, not just an individual operating by himself. Producers have been woefully unappreciative of this fact. It is no longer profitable just to produce and produce and produce. The producer must become informed. He must learn what the market wants, the shifts that are being made in consumer demand and acceptance. What value is Golden Self Blanching celery when the market wants Green Pascal? What use to pick green peaches that will never ripen? Why harvest produce in the field in such a careless way that the retailer must trim excessively and charge a big mark-up to cover his loss?

The producer must learn acreages in various crops, seasons of production, picking dates, weather factors, production estimates, prices and local outlets. He needs to study marketing problems much as he has studied production problems. He needs to take as great an interest in the movement and sale of his product as does the factory foreman in the articles he manufactures. He needs to visit market centers and even try his hand at selling—for experience and appreciation of the problem.

Not all the responsibility rests on the producer. There are too many watertight compartments in the marketing stream. Movement should be like that in a smoothly flowing pipeline, each section related to the other. The consumer is the one who opens the water tap; unless he does this, there is no flow. Extra pressure at the production end of the line will do nothing more than burst the pipe, spelling disaster to all.

Because of this dependence on the consumer, all eyes these days are turning his way. Independents, chain stores, trade associations, advertising agencies, and production cooperatives are studying what he wants and how best to deliver and satisfy him. For example, the United Fresh Fruit and Vegetable Association and other groups are conducting classes all over America showing grocers how to handle, display and sell produce. True, it helps the grocer, and likewise the jobber, the

wholesaler, and the railroad, but it also helps both the consumer and the producer. This innovation is proving an important agency in perfecting a successful marketing chain.

What Kinds . . . How Much Livestock?

Condensed from Iowa Farm Science

Kenneth Oakleaf

ON most farms, raising livestock means more income. Grain crops are ordinarily worth more when marketed as livestock products than when sold directly as grain. Though forages help improve the soil, they have little other use than for livestock feed.

Raising livestock enables a farmer to have a larger business volume for a particular size of farm; it puts his capital to work and increases the productive use of his labor. It also helps to keep fertility on the farm.

Farmers know these things—but deciding what combination of livestock will work best on your farm and under your management is a lot more difficult. You want just the right "balance" among the different livestock enterprises—the combination that makes the most total profit.

That's why it isn't enough to think just in terms of a single enterprise. Lots of times it doesn't pay you to get that last dollar of profit from a particular enterprise. Rather it's the efficiency of all the enterprises combined that decides total profit.

The job of fitting each enterprise to the "most profitable" over-all combination is pretty complicated. Who can figure out all the costs and incomes that go with different livestock enterprises?

But ordinarily these decisions don't all come at once. You make them an item here and an item there, one resource at a time. Still the decisions have to be made. And since they do, certain principles may help you make them more intelligently.

The first job is to fit your program to the resources that you have to work with. These fall into four main groups.

- Your own special skills in handling particular kinds of livestock.
- Your feed supply.

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- Labor available.
- Capital, equipment and buildings.

We include special management skills because these are a special resource that you may have. Every farmer has to use management, whether he is a livestock farmer or not. But if you have unusual ability in handling a particular kind of livestock, if you get better than average efficiency out of that enterprise, then you can probably afford to go into that enterprise more heavily than others.

Sometimes this is a matter of special interest—some farmers prefer working with poultry, or with dairy cows, or with some other livestock. And where there is this special interest, there is often unusual skill in care and management.

But do not mistake a special interest for a special skill. The skill we are talking about is the kind that you develop over a period of years from handling a full-scale livestock enterprise under farm conditions. It is reflected in good sanitation practices, the rations you feed, in timeliness and in getting the work done efficiently. It's a skill that is seldom developed without the help of actual experience.

Feed records show this quite clearly. For the same year and for the same class of livestock, the feed returns earned by individual farmers differ widely. Check your own performance on the basis of such records before deciding that you, too, have a special skill.

Another kind of management skill—buying and selling skill—makes a big difference in some enterprises, especially cattle feeding. Many farmers add a good deal to their farm income just because they are unusually shrewd at buying and selling animals. This boosts farm income, although it isn't the direct result of efficiency-within-the-farm. Such farmers are often pretty good feeders too, incidentally.

Feed supplies include two things—(1) the total supply of feeds produced, and (2) the proportion of different kinds of feeds produced.

On most farms several crop rotations will give high feed output. But they may produce rather different proportions of grain and forage feeds. So the individual farmer has a good deal of leeway in adjusting his livestock program to feed supply—and, the other way around, he can adjust his crop program to meet the needs of his livestock.

Under some conditions, it might pay to follow a crop program that gives you the needed combination of grain and roughage feeds even though this takes you away from highest total feed output. For instance, if special market conditions favor the sale

of fluid milk, it may pay you to specialize in a large dairy herd. Then you would adjust your crop program to feeding that herd, and to the job of producing all the milk you possibly can.

However, you will seldom gain by departing very far from your best total crop output.

Often the size of a farm limits the total supply of feeds available. If this limits your livestock program also, then some of your management, labor or equipment resources may not be used to capacity. In such cases buying the extra feed may enable you to use these resources to capacity, increasing the volume of output—and hence income.

In general, the basic principles of relating livestock handled to crops grown are simple enough. In Iowa our livestock farming is clearly geared to the crops we raise. Corn gives us our highest feed output. And we raise hogs to convert the corn into a product of highest value. Then we raise roughage-consuming livestock to use the forage we grow in our rotations.

The types of farming found in different sections of the state are basically sound—they are fitted to local conditions within each area, worked out by experience over a period of time. Individual farmers will do well to observe those conditions, and the type of farming they best support. Then adjust your own enterprise combination to these conditions and to your own resources.

Farm labor has been a rather scarce item in recent years. At other times, there's been a good deal of it in relation to the equipment, feed and other resources needed to farm. Also, changes in farming methods have changed our resource needs somewhat. So past relationships may not be the best guide.

Each type of livestock takes a particular combination of resources—labor, equipment and feed. Hogs take relatively little labor and equipment, but need a lot of grain feeds. Beef cattle also have rather low labor and equipment needs, but require more roughage feeds. Some kinds of cattle take rather high investment in animals alone.

The table shows the average resource needs of different types of livestock, based on average figures for a large number of midwest farms. From this the total resources needed for any particular combination of enterprises can be estimated.

Different production methods also affect the resources used, however. And within each livestock enterprise the proportions of labor, feed and equipment can be adjusted a good deal. Farrowing early pigs takes more equipment and labor than farrowing late pigs. And a program that

carries light cattle along on grass takes a different combination of feeds, labor and other resources than fattening heavy cattle in the drylot.

Many farmers have been able to level out their year-round labor needs pretty well. Plan your livestock program so that it won't take a lot of work during planting and harvesting season, when you are busy with crops. This makes sense whether your own family supplies the labor or you keep a full-time hired man the year round.

The timing of production usually affects the price you get on the market. All livestock products have some seasonal price variation. In addition to this, the general price trend may be up or down, and the prices for certain types of livestock may be above or below average during a particular year.

All this affects your livestock program. In high price periods—when future prices are apt to be lower—a program with rapid turnover and low capital requirements offers the least risk. By pushing meat animals along with plenty of feed, you have a better chance of getting your animals to market before the rush, and before the price drops seriously.

In years when feed is high priced—as in 1948—you may gain more by roughing animals along on grass and roughage until a new crop comes in. This gives slower gains, but feed costs are less and again risk is kept low.

Here's a Rough Estimate of the Resources Needed to Add $1,000 Gross Income From Livestock on an Average Corn Belt Farm (1939–'43 Prices)

	Chickens Mainly for Eggs	Hogs	Dairy	Feeder Cattle
Number of Animals Needed	235 Hens 500 Chicks	40 Pigs 6 Litters	6 Cows 8 Young	20 Steers
For an Added Gross Income of	$1,000	$1,000	$1,000	$1,000
It Takes This Much for Feed	$ 515	$ 606	$ 570	$ 780
Giving This Return Per $100 Feed Fed	$ 194	$ 165	$ 176	$ 128
And Takes This Much Labor [Man Hours]	570	200	780	240
Plus This Much Capital Invested in Livestock and Equipment	$ 450	$ 320	$ 820	$1,350

If your knowledge of market conditions is pretty good, you may gain by keeping your business flexible. Then you can adjust your livestock program to take advantage of the price movements in the market. On the other hand, many farmers don't like to take chances on what the market will do. They choose a livestock program that has proven to be sound for their particular conditions, then work for efficient, high-volume production on that basis.

The chance for a gain usually carries a good deal of risk with it. It takes capital to afford this risk. What you lose in one year, you can make up in another—maybe. But the farmer with limited capital can't afford to plunge. He has to settle for a smaller gain, and one that is more certain.

Feeding beef cattle is usually considered a high risk enterprise. A dairy herd gives somewhat lower returns, but gives an income you can count on year after year. Your own financial resources and needs will help determine the most suitable combination on your farm.

For many types of livestock, housing is often the limiting factor. So make the fullest possible use of the buildings on your farm. Often a little low-cost remodeling can make buildings more efficient. Old horse stalls can be made over into pig farrowing pens.

On many farms one particular resource may be limiting your total output. It may be buildings, or labor, or something else. But if the lack of just one resource is keeping all your other resources from being fully used, then it will probably pay you to buy more of that resource. It may pay you to buy a little extra feed, or remodel a building, or hire a little more labor, if by so doing you can increase business volume and use your other resources more fully. It will pay you to expand as long as the added production will pay for all of the added costs involved.

The successful farm manager continually adjusts his livestock program to fit changing conditions on his farm. He adjusts and recombines his enterprises to get the most profit from his business at all times.

Personal likes and family goals will affect the choice of livestock enterprises on a farm also. But we still make most of our decisions in the interests of greater profits—maximum income. So let's summarize in those terms.

Suppose that if you invest a few more resources in raising hogs, you gain back more than you invest—you can make a profit.

But suppose you could make a still greater profit by investing those same "additional" resources in cattle. You make the same in-

vestment but get more in return. Obviously, if this is the case, it would hardly pay you to expand the hog enterprise. By doing so you would gain less profit than you could make from expanding your cattle.

Then the profit you might make from hogs is not really a profit at all. The only way you can make a profit in this sense is to expand the enterprise that will give you the greatest added return.

Blizzards Emphasize Wisdom of Windbreaks

Condensed from Western Farm Life

Don Bloch
U. S. Forest Service

Once ridiculed and too often neglected, shelterbelt and windbreak plantings on farms and ranches proved their worth in the blizzard-bound West last winter. No figures are available to show the human lives saved, the numbers of livestock and wildlife which survived, or what damage to homes and other farm buildings was averted because of existing protective plantings. Neither are figures available to show how much greater those losses might have been with no shelterbelts and no windbreaks.

There are, however, definite estimates on livestock and game animal storm losses in the four states worst hit. For Colorado, Wyoming, South Dakota and Nebraska total losses are estimated at 82,000 sheep and 81,000 cattle.

Nebraska lost most heavily—46,000 cattle and 28,000 sheep; Wyoming lost 16,000 cattle and 49,000 sheep; South Dakota, 16,000 cattle and 13,000 sheep, and Colorado lost 3000 cattle and 2000 sheep.

Measured by whole livestock population, cattle losses were about 5, 3, 2 and 1 per cent, respectively, for Nebraska, Wyoming, South Dakota and Colorado. Sheep losses were a little less. By specific locality, losses on each category ranged as high as 90 per cent for some stockmen in a few areas.

"Livestock in several sections," according to the department of agriculture report of March 1, "have emerged from the severe blizzards in the poorest condition

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listed in 26 years of record."

Game loss estimates are not in yet for the entire area, but it is known that wildlife suffered a heavy toll. Many thousands of game animals, prairie chickens, grouse and pheasants perished.

In Goshen county, Wyoming, 70 per cent of the 23,000 pheasants counted there last fall died in January and February. With normal food supplies covered by snow, and a minimum of cover and shelter available, both game animals and birds were driven into the clear where they froze or starved to death.

It has been proved that protection against the recurrence of similar losses in the event of another series of storms lies in large part with properly located and maintained shelterbelt and windbreak plantings. Testimony from scores of ranchers and farmers who were interviewed by, or voluntarily wrote to representatives of state and federal conservation agencies, bears this out.

Since the storm, a sharp rise in orders for windbreak trees under the Clarke-McNary act has indicated that ranchers believe trees in well-spaced rows do "temper the winds."

Although January and February winds blew ill in the main, they were good for demonstrating, under the most severe and unusual conditions, just what "bugs" were in windbreaks and shelterbelt plantings which did not prove entirely effective. They were planned primarily for protection against wind erosion. However, other purposes, including protection during blizzards like those of 1949, were intended. Obviously, not all plantings operated perfectly.

The forest service's reforestation chief for the Rocky Mountain area, believes the role of shelterbelts in furnishing protection of all kinds was well-focused during the last winter, especially in western Nebraska and eastern Wyoming. However, a recent survey in those areas indicates a number of ways in which plantings can be "more useful and beneficial."

"Where properly planned," says Mr. Higgins, "shelterbelts served the most useful purpose in checking snow, giving badly needed protection. Larger plantings proved most effective.

"Common faults are planting trees too close to buildings and having an inadequate number of rows of trees. On many farms, existing windbreaks should be supplemented by additional single rows of trees on the north and west sides of the main belt to serve as 'snow traps' and make for more uniform snow depth. Properly used, two or three rows of conifers or hardwoods for this purpose will be very helpful."

Snow traps, it is explained,

consist of three or four rows of trees, planted 50 to 75 feet behind the regular windbreak planting. Then the snow piles up in the space between the regular windbreak and the several rows of trees outside.

Rows of trees planted directly along the north and west sides of main highways cause overdrift of snow on the roads, Higgins reports. This difficulty can be overcome by placing the trees 100 to 200 yards off the right-of-way.

"Even one or two rows of closely planted trees prove effective in checking drifting snow," Higgins says. "All plantings observed were piled full of snow which had crusted over, causing serious damage and breakage, particularly to conifers in the shelterbelts. Widely spaced tree rows resulted in less snow breakage and were fully as effective in stopping the snow.

"If planted too close to buildings," Higgins notes, "shelterbelts do more harm than good. The purpose of the planting is to keep snow away from the building area, not to pile it on the buildings. I saw tons of snow break down roofs and entire buildings in some cases. Farmers should not trim out the lower branches in shelterbelts. They stop the snow before it blows on through the shelterbelt."

Active on several fronts in the four states during the winter emergency, the forest service, through its Washington chief, Lyle F. Watts, has urged government support for a plan to give stockmen every possible aid in a big shelterbelt program.

"The best chance Rocky Mountain stockmen have to protect livestock from blizzards," states John W. Spencer, Rocky Mountain regional forester, " is through planting shelterbelts. Building shed shelters is impractical, as they fill with snow except in a mild snowstorm. Shelterbelts afford real protection. Snow might pile up tree-high within and immediately beyond the belts, but strips of almost snow-free ground on the leeward sides offer excellent protection to livestock in a blizzard.

"Game and domestic animals would gather there. Feed could be placed in advance of a storm along the leeward sides to carry the animals through. Shelterbelts would not solve the blizzard survival problem in such places as the Red desert of Wyoming, of course, but if the right kinds of trees are planted stock will survive throughout most of Nebraska, eastern Colorado and Wyoming, and through the Dakotas."

In addition to their indicated blizzard-time value, according to the forest service, field shelterbelts furnish protection behind which good soil and cropping practices are most effective.

Without such protection, these practices are frequently inadequate to hold soil and assure a crop in critical periods when moisture is short. However, it does not follow that such plantings always will insure a crop in the most unfavorable years.

Each prairie farm should have a windbreak to protect both the farm home and the feedlot. Less fuel is required to heat a protected house, and protected livestock require less feed in winter.

Properly distributed in shelterbelts and other plantings, 8 to 10 acres of trees are adequate protection for the average 160-acre farm. Trees will furnish fuel and posts, and cover for game birds which eat crop-destroying insects. Trees are among the least expensive improvements which any farmer can add to his land.

On the Great Plains, where natural tree growth is lacking for the most part, and where winter blizzards and hot summer winds sweep unchecked across the land, the need for trees long has been recognized. Early settlers found the lack of trees a serious handicap, and the Kansas Horticultural Society in its annual report for 1880 reported that "those settlers who planted shelterbelts and groves are fixtures on their land, while those who never planted trees have pulled up stakes and gone elsewhere."

Influenced by the recommendation of the then secretary of interior that a certain proportion of the area should be forested as a measure of protection to the soil, congress in 1873 passed a law designed to accomplish that end. Known as the "Timber Culture Act," it provided for an additional tract of land to be offered to the homesteader on the sole provision that he plant a part of it to trees.

This law was later repealed, but it resulted in the planting of millions of trees, many of which still survive. Later, the Clarke-McNary act was passed, providing, among other forestry measures, for the distribution of tree-planting stock to farmers. This co-operative program, set up on a nation-wide basis, offers western farmers and ranchers the opportunity to furnish adequate protection to their livestock.

Use These New Fly Killers

Condensed from the Farm Journal

Robert D. McMillen

For the time being at least, the USDA has recommended that methoxychlor be used instead of DDT to control insects on milk cows and in dairy barns. (Pronounced meth-OX-i-klor.)

Methoxychlor's big advantage over DDT is that it doesn't show up in milk or milk products the way DDT does.

After several years of study, Food and Drug authorities think that small amounts of DDT in milk and milk products might prove harmful, since practically everyone gets milk in one form or another nearly every day.

This doesn't mean that you need to stop using DDT entirely. If you follow directions, it's safe for controlling pests on other livestock, including beef cattle. Authorities also say you may continue to use DDT (as well as chlordane, benzene hexachloride, and other insecticides) to control flies in and around the other buildings.

Methoxychlor is another of the newer insecticides. It was discovered in 1942, and has been tested since 1944.

It gives a fairly fast knockdown and does a good job of controlling horn flies, house flies, and mosquitoes.

This new chemical has given good control of weevils and other pests in stored grains. Tests have shown it to be effective against certain pests on vegetables, fruits, and field crops. It will probably have other uses.

While the USDA at present recommends it only as a livestock spray, several state experiment stations are recommending it for certain crop pests.

Methoxychlor comes as a wettable powder. For best results, put it on the same way you would DDT—as a spray. Make sure you wet the cow's head, body, and legs. It'll take from 1½ to 2 quarts of spray per cow to do a good job.

DuPont's directions call for mixing 2 pounds of powder with 25 gallons of water. This should treat 50 cows. One spraying should last three weeks, depending on the weather. In some tests, a spraying has lasted longer.

To spray your barn (and here

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the material will kill pests for up to six or eight weeks), DuPont recommends that you mix a much stronger solution—1 pound of powder to 3 gallons of water. Three gallons will cover about 3000 square feet of surface. Spray the walls, floors, ceiling, and other places where flies congregate. Other brands may have different directions, so read the label.

Actually, no one is going to come out to your farm to see which insecticide you're using. No one is going to stop you from feeding your milk cows hay, fodder, or silage containing small amounts of DDT. There's nothing to keep you from eating, or even selling your products if you go against the recommendations.

But the Food and Drug Administration has said that Federal inspectors may keep milk or milk products (butter, cheese, etc.) containing even so much as a trace of DDT from crossing state lines. Federal courts can condemn such shipments under a law which prohibits the presence of an "added poison" in food.

Since DDT likes to tag along with cream and show up in butter, creameries will be mighty particular about the cream they buy. Dairies buying milk will probably require farmers to guarantee the milk to be free of DDT.

Other news on insecticides this spring concerns pyrethrum, an old standby that's been on the back shelf for a few years. Today's pyrethrum sprays have more "kick" than they used to have; they kill faster and last longer. That's because scientists are mixing in some new chemicals.

Pyrethrum can be safely used on milk cows, in barns, food stores, inside the house, and on crops. The USDA is suggesting you use pyrethrum sprays as fly killers this year.

The thing for you to do when buying pyrethrum sprays is to make sure you get the "souped-up" varieties. Look on the label to see if it contains pyrethrins, which is what you're after.

U. S. Industrial Chemicals, Inc., manufactures a pyrethrum insect spray which they call "Pyrenone." Besides pyrethrins, Pyrenone contains piperonyl butoxide which USDA says makes pyrethrum do a better job.

Other companies will buy Pyrenone from U. S. Industrial Chemicals and sell it under their own trade names.

These new pyrethrum sprays protect animals against horn, deer, horse, and stable flies as well as lice and other pests. If it isn't washed off by rain, one spraying may last from two or three days to a week or more, depending on the kind of pest.

Use pyrethrum sprays directly on the animal according to the

directions on the label. Most farmers will buy pyrethrum in the form of a concentrate containing 1% pyrethrins and 10% piperonyl butoxide. You'll want to thin-out the concentrate with water.

Some insects are tougher than others but an average mixture that usually gives good control of flies is 1 part concentrate to 20 parts water. Stable, horse, and deer flies will take a stronger spray, and a 1-to-10 mixture is suggested. For horn flies, you can dilute 1 part of concentrate with 40 parts of water and get good control. Put on about 1 quart of diluted spray per animal.

Pyrethrum isn't too expensive to be used in killing flies, and it may get cheaper. A remarkable discovery was announced in Washington recently when the USDA reported that bureau chemists had found a way to make pyrethrum in the laboratory.

Up to now, the only known way of getting pyrethrum was to grind the heads of a plant (a chrysanthemum) grown mostly in Japan and Africa.

While it's impossible to predict exactly when you'll be able to buy synthetic pyrethrum, it is something to look forward to.

Cows in Big Herds Do Better

Big dairy herds usually produce more and make the most money. And if you don't have a big herd, you have to compete against the big boys, anyway.

Recent figures show that herds of 5 to 9 cows milked an average of 4,317 pounds in this country; the 15- to 19-cow herds averaged 5,377 pounds; 20- to 29-cow herds averaged 5,788 pounds.

Usually, the more cows you have the more money you have to spend on up-to-date methods. And the more cows you have the more money you will make from using better feed, sires, care, equipment, and methods.

—Farm Journal

More Summer Eggs

Condensed from Poultry Tribune

Dr. H. R. Bird
U. S. Dept. of Agriculture

In 1948 the "average" hen in the United States laid 162 eggs. Being an "average hen," however, she laid too many of these eggs during the spring when fresh eggs were abundant and prices not the best.

But after all, why should a hen interest herself in the law of supply and demand? That is the concern of the "average poultryman." He can increase his financial returns if he can get his hens to lay well when the production of the "average hens" is falling off.

In 1948, the average hen laid 12.4 eggs in February, 18.1 eggs in April, 15.2 eggs in July, and 13.7 eggs in August. Between 1937 and 1946, prices received by farmers for eggs averaged 5.2 cents per dozen higher in August than in April.

These figures make it clear that it is desirable to keep hens laying right on into the summer.

Why do they so often drop in production with the arrival of hot weather? The usual answer is that hot weather decreases feed consumption, and decreased feed intake means lower egg production. It is said that if you can maintain feed consumption at a high level, egg production will be maintained.

It seems more likely that decreased feed consumption and decreased egg production, instead of being cause and effect, are two related effects of certain physiological changes brought about by high temperature. Therefore, if you maintain high feed consumption you do so by correcting the unfavorable environmental effect (high temperature) and if you correct it for feed consumption, you correct it for egg production.

This would suggest that there is something more important than the feeding program in working for better summer egg production. Certainly the first consideration is to make the environment of the hens as comfortably cool as possible. The laying house should be convertible to the open-front type in summer, and windows or ventilators or both should be open at the back of the house. Plenty of cross ventilation, with

Reprinted by permission from the Poultry Tribune, Mt. Morris, Illinois, May, 1949

some kind of roof insulation will help to keep the temperature down.

One way to provide a good summer environment is to let the hens out into a well-shaded yard. This does not mean they should be allowed to roam over 40 acres. Layers should be kept within commuting distance of the feed hopper in summer as well as in winter. A supply of feed and water should be provided out-of-doors, in a shady location.

The well-shaded yard may be a bare yard if desired, or it may be planted to a pasture crop. It should be noted that in most parts of the country, good pasture will not be available in July and August unless pasture crops suitable to the area and time of year are planted.

Good pasture can provide 10 percent of the feed required by the birds and it probably aids in preventing the spread of disease and parasites. However, green feed of any kind increases the intensity of yellow color of egg yolks and makes the yolks more variable in color. Both of these effects are undesirable in some markets.

Whether pasture is provided or not, the ration will consist principally of mash and grain. The most important thing to be said about a feeding program for hot weather is this: The hens should be given the benefit of the best possible feeding program from the time they are pullets, and when hot weather comes the same program should be continued. Change and irregularity are undesirable.

The mash should be of high quality and it should be available to the birds all of the time. If it is a commercial mash, the feeding program recommended by the manufacturer should be followed. Daily additions of fresh mash to the hoppers will help to prevent a falling off in feed consumption. If this involves too much labor, the mash in the hoppers at least should be stirred daily by running the hand or a stick through it. If grain is hand-fed at certain times of the day, a regular schedule should be followed.

Plenty of drinking water should be available the year round but its importance is increased in the summer. Chickens do not perspire, but they do lose moisture by breathing out air of high moisture content. A five-pound hen will lose about 35 grams of water in 24 hours in this way if the temperature is 70 degrees Fahrenheit. When the temperature goes up to 90 degrees she loses about 175 grams in the same length of time.

There is a common belief (it might almost be called a superstition) that the proportion of grain fed to layers should be decreased in the summer in order

to prevent excessive fattening and excessive heat production.

Actually, a decrease in the proportion of grain increases the protein content of the diet, since mash contains more protein than grain. An increase in protein increases heat production. Thus one might expect the results of this practice to be exactly opposite to those desired. This expectation is supported by results obtained at the Southwest Poultry Experiment Station of the Bureau of Animal Industry, located at Glendale, Arizona.

The results of these experiments indicated that it was not advantageous to reduce the proportion of grain in the diet of laying chickens during hot weather. There was actually more mortality in the groups receiving the diets moderately high in protein (low grain diets) than in the groups receiving the standard diets or the diets low in protein (high grain diets).

A period of very high temperature, just as a period of very low temperature, may cause the hens to be less active and spend less time at the feed hoppers. At such times it may be desirable to modify even a good feeding program to increase feed consumption. Pellets ordinarily are more palatable than the mash from which they are prepared, and they permit more rapid filling of the crop. Therefore, they are useful in stimulating feed consumption.

If used, they should be scattered over the mash in the hoppers in order to encourage consumption of the mash. Since pellets are necessarily commercial products, the manufacturer's recommendations should be observed.

In summary, we may say that the first step toward good egg production in an August environment is to get rid of the August environment as far as possible, by proper ventilation and insulation. The second step is a good year-round feeding program, with special attention during hot weather to an ample supply of fresh water, frequent additions of mash to the hoppers, and possibly special aids to feed consumption, such as pellets.

Organic Farm Power

Archer P. Whallon

IT may be that before many years it will be the ordinary thing for the farmer to heat and light his buildings, and drive his car and tractor with gas power derived from his manure pile and compost heap, and many a town and village will solve its garbage disposal problem in a like advantageous way. That is the potential implication of a revolutionary development now taking place in France and Germany—the production and use of methane gas derived from organic wastes. It seems an astonishing oversight that practically nothing has been published in the English language about an agricultural innovation of such vast possibilities—one that may enlarge the field of organic agriculture almost beyond imagination. However, some literature is available in French and German. In the January 1949 issue of the well known French magazine, "Vie a la Campagne", is a leading article, "Un Gisement de Carburant dans Votre Ferme", which gives a fairly complete description of "le gaz de fumier." Also, in the Sunday edition of the New York City German language paper, "Staats-Zeitung und Herold", for March 6, 1949, that paper's correspondent in Hamburg gives an account of an organic methane gas plant in western Germany. The present article is based on, and consists mainly, but not exclusively, of translations of extracts from these works. Anyone who desires further information should read them in the original, some of which is rather too technical for one with but little knowledge of chemistry.

Methane, CH_4., (the English spelling often menthane, or menthan) also called metagas or zymogas, is known, in the impure state, as marsh gas or firedamp. It is present in stagnant pools and swamps where organic matter is allowed to decay in a limited supply of air, as often under water. It is a colorless, inodorous gas with a density of 0.559 (Air = 1.) It burns with a faintly luminous flame and very hot heat. Mixed with air or oxygen in certain proportions and then ignited it explodes violently, one volume of methane forming with 9.5 volumes of air an extremely explosive mixture. As the firedamp of coal mines, methane has been the cause of catastrophic explosions.

Probably the existence and distribution of methane gas is greater than known, for its presence would not be recognized unless

ignited, and under natural conditions, it would be quickly diffused and disappear in the air. However, it occasionally becomes ignited over swamps and marshes, sometimes arousing the fears of the superstitious. Possibly the best known of these occurrences is that of the "Holy Fire" of Baku, in the neighborhood of the Caspian Sea. I recall also that some forty years ago, people in my home community in southern Michigan became much concerned over some mysterious fires over and on the banks of some swamp ditches and ponds, which were finally identified as "marsh gas" flames.

Methane gas has been known from antiquity, and according to the writer in "Vie a la Campagne", as far back as 1776 it was studied by Volta, the Italian scientist, from whose name stems the electrical term "volt". There have been made, at various times, suggestions for the practical use of methane gas, as in 1884, when there was a plan for the use of the manure from the stables of the horses then used to pull the Paris omnibusses. But this was abandoned because of technical difficulties then seemingly beyond solution, and further experiments were retarded by the following abundance of gasoline.

The former mechanical difficulties are now practically overcome, and the current apparatus for methane gas manufacture is described as simple, and of a robust construction, resulting in a rapid amortisation of the initial cost. The equipment described and pictured as used in France, is relatively simple and not above prohibitive cost for the average farm. It is composed essentially of 2 or 3 concrete tanks of an average capacity of 10 cubic meters. Two tanks at least are necessary to assure continuous production. Other material than cement may be used for the tanks, if desired. The tanks may be either above or below the ground level. The latter is advisable in colder climates and high altitude regions, and wherever there is a marked difference between day and night temperatures, as the interior temperature of the tanks should be held as uniform as possible to assure an uninterrupted bacterial action.

The tanks have a sheet metal cover which is fitted with an examination pipe (un bec d'essai). The covers rest on a hydraulic closure that assures an hermetic seal, and forces the gas either into the distribution system, or into a storage gasometer. The use of a gasometer assures a more regular supply of gas to appliances, and an attached purification apparatus results in a better quality gas. The 1948 cost of the equipment in France was, 70,000 francs for one 10 cubic meter tank, 120,000 francs for two tanks, and 70,000

francs for a suitable gasometer—to which must be added the distribution pipe and fittings required.

The method of filling and of management of the tanks is relatively simple and is little more laborious or difficult than the making of a hotbed or compost pile. It is recommended that a starter or inoculation base from a previous fermentation tank be used if possible. Cover the bottom of the tank from 8 to 10 centimeters thick with a foundation of old manure taken from a preceding tank. Then proceed with filling the tank with manure not less than 5 days nor more than 3 months old, well broken up and mixed in a homogeneous mass. Pack firmly and allow the mass to ferment in "heat" in the open air, the tank being uncovered, for 5 days. After this delay, cover with a liquid manure (purin) mixture so that the level of the liquid is 15 cm. above the level of the manure. The liquid from a previous tank is recommended, as it releases an inoculation favorable to methanic fermentation. The manure used should contain a large proportion of undigested vegetable matter, and other vegetable wastes and organic matter may be used. From a first fermentation, the gas becomes combustible between the fifth and the fifteenth days, according to the nature of the material and the temperature during the process. From following fermentations, the gas is obtained in 48 hours. On the average each tank furnishes 3 to 7 cubic meters of gas per day during 3 months.

Methane gas is not dangerously explosive at normal temperatures. The slight odor is inoffensive, but sufficient to indicate its presence in case of leaks in the system, and the gas is not toxic as in gas from coal. Methane gas burns very well in stoves and appliances suitable for burning butane (our familiar tank gas) which require but slight modification. It also furnishes an excellent fuel for stationary gas engines, and when confined in tanks, for cars, trucks, and tractors. Its use is suggested for colonial or frontier regions where oil fuel is expensive or difficult to obtain.

This French writer continues—"Its possibilities of national production are enormous. It could have in France an annual production about equal to that of the gasoline used.

The manufacture of gas from stable manure and organic wastes recovers an energy now nearly a total loss, and it is also the more interesting, because it destroys nothing of the manure, except fortunately, the larvae of flies. On the contrary, it increases the fertilizer value by fixing the ammonial content. There is no loss due to drying by the sun, nor

through erosion or run-off caused by rain, and the material taken from the gas tanks is in better physical condition for spreading on the land."

The accuracy of this statement, that there is no injury to fertilizer value of the organic material so handled, some may question, in view of the exclusion of air from the tanks during methanic fermentation. Air is regarded by some authorities as an essential for the development of beneficial soil bacterial action—but it should be noted, that in the process, air is not completely excluded.

The article, in German, in the "New York Staats-Zeitung", gives very much the same data, but stresses more the possibilities of village municipal methane gas plants.

"In western Germany, the first biological humus and gas works are now in operation. At the agricultural experiment station at Allerhop, near Soltau, in the Lunenburger Heide (British zone), for 8 weeks a daily production of 10 cubic meters of highly valuable menthogas have been produced from potato waste, rushes, weeds, and stable manure. Two kitchens of the station cook regularly by the blue, odorless, gas flames that have their origin in a slime reservoir (Schlammbehälter) located 50 meters distant.

The combined capacity of this first biological humus and gas works (Bihugas Anlage) amounts to 40 cubic meters of gas per day. Of this production, about 10 cubic meters will be diverted to cooking and heating, and the remaining 30 cubic meters will be delivered in gas flasks for tractor fuel. This Bihugas plant, will, besides cooking and heating gas, also produce per day 20 liter (monthly 600 liters) plant-forcing fertilizer, for which no coal is required, but only the manure from 10 cows and about the same amount of organic waste material.

The experimental plant at Allerhop was developed by the combined experimental work of Ferdinand Schmidt, of Verden, and Professor Pöpel, of Stuttgart, who have proved the system so well in practice, that it now seems only a question of time, until large individual residences and village communities can erect their own gas works. In this way, many farm women will be able to cook with gas, farmers will drive their tractors on home-produced fuel, and a better compost will be provided for German farms.

The development of the methane gas plant may be revolutionary in bringing organic farming into its rightful place—with a methane plant as a familiar adjunct to dairy barns and livestock feeding establishments. Also, as the process does not necessarily call for animal manure, the methane gas plant has possibilities as a

profitable disposal measure for garbage and cannery wastes, that as now handled, are often a stream pollution and health menace.

It should be noted, that unlike that other European motor fuel, charcoal or wood gas, which in this land of abundant gasoline, never attained any considerable use, methane gas is a superior and not an inferior product, and that it does not call for the destruction of timber or any other natural resource.

Highbush Blueberries

Condensed from Farm Research

John C. Cain

THE highbush blueberry has been cultivated by man a relatively short time—about 30 years, although its wild ancestors were prized by the Indians prior to the arrival of white settlers.

The necessity and economy of more efficient land usage, concurrent with modern agricultural development, has recently brought this highly prized fruit out of its native habitat into the ranks of other standard cultivated fruits. By selection of desirable wild plants and by breeding and propagation, standard varieties are now in production that far surpass wild plants in size, flavor, and productiveness. Under favorable soil, fertilizer, and cultural practices, yields of 8,000 to 10,000 pints to the acre are not uncommon.

The natural habitat of the highbush blueberry is usually the lowland swamp or hammock under relatively moist, acid (pH 4.0 to 5.0) soil conditions, with a shallow, year-round water table. The shrub has a shallow, fibrous root system that grows largely in the leaf mold and humus layer above the water table in its natural habitat, thus acquiring a maximum of both oxygen and water.

Thus far, most successful commercial plantings have been made on the acid cranberry bog peat and sand flatlands of New Jersey, and sand or peat flatlands elsewhere. However, in general, any soil that is porous enough for the free movement of air and water and has an adequate year-

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round supply of water can be made to produce satisfactory blueberries with proper fertilization.

Recent experimental blueberry plantings at Geneva have made vigorous growth on wet, poorly drained soil when planted on mounds, and with sawdust incorporated with the soil and used as a mulch. Other plants are doing well on a high, well-drained—normally dry—knoll by using heavy sawdust mulch to conserve water. Both of these soils are above pH 6.0.

Sand culture experiments at Geneva have shown that blueberries will grow very vigorously even at pH 6.5 if the necessary nutrients are maintained in available form or fail to grow at pH 4.5 with inadequate nutrients. Blueberry plants seem to have a relatively low requirement for potassium, calcium, and phosphorus, and a high requirement for iron, manganese, and possibly magnesium, compared to fruit trees. They respond vigorously to nitrogen, apparently absorbing the ammonium ion more readily than the nitrate ion.

Most soils with a pH value above 5.5 to 6.0 are fairly well supplied with calcium, are low in available iron and manganese, and the nitrogen is likely to be largely in the nitrate form. In addition, many of these soils have a clay texture, are somewhat poorly aerated, and may be subject to drying at the surface in summer. These may be some of the reasons why blueberries usually fail on soils of this type.

Experimental blueberry plants potted in Dunkirk silty clay loam, pH 6.5, mixed with sawdust or vermiculite to improve drainage and aeration, have grown well when irrigated with a suitable nutrient solution. Other plants potted in the straight clay soil acidified to pH 4.5 failed completely even though irrigated with the same nutrient solution. This indicates that aeration is an important point.

More Buyers Mean Profits With Purebreds

Condensed from the Ohio Farmer

Earl W. McMunn

You can't make money with purebreds unless you can get them sold! That's a simple idea, but it's the stumbling block upon which more than one purebred breeder has failed. Marketing is relatively simple for the commercial breeder. When the steers or hogs are fat, he sends them to market. Not so with purebreds. Their immediate end is not the butcher's block. Instead, they must find their way as seed stock into other herds. This means that buyers must be found.

There's some merit to the old story that if you build a better mousetrap, buyers will wear a path to your door. But it is no longer so simple as that. Breeding good animals is the first step to success in the purebred business, but it is only a step. After that the right prospects must be found and persuaded to buy.

Ohio has many examples of purebred breeders who have developed sound selling methods. They have made money—first, because they have bred good animals; and, second, because they have the secret of getting those animals sold to the right buyers.

What does it take to sell purebreds successfully? To find out, let's visit one of Ohio's most successful sheep breeders. He is Farrell M. Shultz of Logan County. This young breeder has made an enviable record with his purebred Shropshire sheep. He has produced many show winners. These sheep have also met the final test of going into other flocks and producing the right kind of offspring for their buyers.

Shultz has developed some down-to-earth ideas about selling his sheep that would apply equally well to any other class of purebred animals. It goes without saying that he started with foundation stock of the right kind. The very first point is to have animals that prospective purchasers will want to buy.

Granting you are a good breeder—you still have to develop the confidence of the customer. Shultz says: "In my opinion the very first thing a purebred breeder must do to sell his product is to give his customers a feeling of confidence." This means that in showing an animal to a prospect the poor points of an animal must be

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explained as well as the good. Also, "always try to sell the customer an animal that will improve his herd or flock."

Another way to develop customer confidence is to "make your word good regardless of cost." Customers are almost sure to come back if they find that a breeder's word is always good.

Shultz has developed another idea that's unusual in livestock circles even though it is practiced by most commercial concerns—he sells his product under brand name! Here's how it works: His breeding rams are divided into three classes. They are labeled "Flockmaster," "Shultz" and "Commercial."

The Flockmaster is the top classification. Only about 20 per cent of the rams fall in this classification. They must be out of top-producing ewes. They must be backed by a pedigree of outstanding individuals. In addition, the ram must be of such type and conformation that he can go into any purebred flock and appear as a worthy addition. These rams are backed by a guarantee. Shultz says: "Flockmaster rams must produce lambs of satisfactory type or they will be replaced."

Next grade is labeled "Shultz" and about five per cent of the rams fall in this classification. These are rams that lack just a little in some point but are still of sufficient quality to go into a smaller purebred flock.

The third grade is known as "Commercial" and Shultz puts about 50 per cent of his rams in this class. They are rams that this breeder considers good enough to use in a commercial flock for the production of market lambs.

Here is where he makes a strong point. He says: "I think that as purebred breeders we fall down when we try to breed sheep that will win in the show ring and to sell to other purebred breeders. We then sell to the commercial man the animals that aren't good enough for the show ring. Instead, we should be trying to breed an animal that will fit the needs of the commercial breeder!"

Shultz goes on to explain: "After all, the end of any purebred livestock enterprise must finally be the butcher's block. I am trying to breed a sheep that will fill the needs of this commercial breeder. We may not get as much per head for these commercial sheep, but in the end this must be where the bulk of our sales come from. If I were to lose any part of my trade, this would be the part I would hate most to lose."

Finally, about 25 per cent of the rams from this flock go to market as meat animals. Shultz explains that no breeder can produce all animals that are up to par. Those not meeting the standards should

be sent to market and not sold on the reputation of the breeder. In fact, such selling can only undermine a breeder's reputation.

Sending purebred ram lambs of off-grade to market can even be profitable. Shultz points out that a year ago he sent his market ram lambs through the local lamb pool and they averaged about $25 per head even though they had not received a bit of grain . Yearling rams selling for $45 to $60 will not return as much clear profit after costs are figured.

After good sheep are produced and classified for sale, there are still other points to remember, according to this breeder. He emphasizes that the farmstead should be kept neat and attractive. You can't expect others to buy animals from you if your place looks as if those animals haven't been making money for you!

Another point to remember is: "Have the animal ready to sell when it is time to sell. In caring for yearling rams to be sold in August or September, have them looking the best possible at that time of the year. Have them carrying the right amount of fleece (about five month's growth) and and in good flesh."

It's true that animals in good flesh sell better. Buyers declare they don't want to buy a fat animal but still look for that kind.

One advantage of a public sale is that animals can be "pointed" to arrive in top condition at the time of the sale. And here, again, is a sales idea that Shultz believes is sound—one year he holds a public auction and the next he exhibits at the fairs. In this way, there is no holding back of top animals from the sale for the show string. The year of the sale some of the best animals in the flock can be sold. The following year the top animals are fitted for the fairs.

This system has certainly helped to develop confidence on the part of buyers, as proved by records of the sale held last summer. In that auction he had 60 head that brought an average of $131. Ten of these were "Flockmaster" rams and they brought an average of $300 with the highest going at $400 and the lowest at $265. Included in the sale were yearling ewes, yearling rams and about 20 lambs.

Naturally, Farrell is pleased with these good prices. But at the same time he sees the danger that farmer-breeders may be frightened away by the idea that purebreds are too expensive to buy. Of course this is not true, because many good animals can be bought at a price the average flock-owner can afford to pay.

In addition to ideas for selling purebreds. Shultz has some "don'ts" They are:

"Don't sell a $50 ram to someone for $100 just because he doesn't

happen to know any better.

"Don't try to sell a sheep that looks like a cull, even if his ancestors were 'high-powered.' Keep him around until you get him in sale condition, or if this is impossible, send him to market.

"Don't sell the really good ones too cheap. It takes a long time to produce that kind.

"Don't forget that the butcher's block is the final measure in the meat industry. Develop your breed with that in mind.

"Don't fail to have the sheep as free from parasites as possible. The same is true of diseases.

"Don't, in the case of a public auction, permit by-bidding, running up of animals or selling before the auction and then putting the animal through the sale at a high price to get publicity. One thing sure, if a customer gets a bargain in one sale he will be back again for your next sale!"

The Secret of the Maple

Condensed from the New England Homestead

Jack Spaven

ALTHOUGH the season's last bucket of sap has been collected, boiled down, and made into syrup or sugar, in Vermont there is a small group of workers who are just starting their maple harvest. These research workers at the Vermont Agricultural Experiment Station will do their maple processing with a battery of adding machines and laboratory equipment. Their results will be more information on how and why the maple tree produces sap.

Northeastern farmers may someday pick maple trees for their sugar bush the way they select high producing cows for their herds, if these Vermont Agricultural Experiment Station scientists are successful in their efforts to develop a top-notch strain of maple tree.

Since sap yield and sugar content varies between trees much the same as production of milk and butterfat varies between cows, Drs. James W. Marvin and Fred H. Taylor hope that they can develop a strain of fast-growing maple-tree that will give a high yield of sugar-rich sap

As the two men point out, the maple tree is the only important economic plant that has never been domesticated. The maple tree of 1949 is the same as the maple tree which gave the Indians their first maple syrup centuries

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ago. Economically, the maple sugar business is a big one, annually bringing in $12,000,000 to farmers of the nation.

Marvin and Taylor are not yet sure what kind of a maple tree they can expect to get, but they are aiming for a tree that will become productive in 20 years instead of the 40 years it now takes. They hope that their tree will yield about three times as much as the present wild tree and that its sugar content will average 6% instead of 2% from the average maple.

Although maple research has been going on since 1870, there are still many vital questions about sap flow, sugar content, and growth that are still unanswered. This means that the Vermont Experiment Station men must develop their own research techniques and instruments.

The two Vermonters started their initial research five years ago Using maple saplings two inches in diameter, and a home-made freezing unit, they were able to study sap flow in their laboratory in mid-summer.

They also tagged 3500 maple trees in Jericho and Underhill to collect data on sugar concentration. In 1945, former Governor Mortimer R. Proctor bought for the Vermont Agricultural College a farm in the town of Underhill selected by the maple research workers. They now do much of their research at the Underhill farm.

They plan to use forty acres of cleared meadow land on the maple research farm to experiment with the growth of maple trees. The Vermont men will make cuttings from selected trees picked for their high yields, and high sugar content sap. Marvin and Taylor will subject these young trees to varying conditions of fertility, sunlight, and moisture. A big problem in using cuttings has been to produce a satisfactory root system for the cuttings. Taylor and Marvin think that they have this problem solved now. Although it will be years before the cuttings reach a size suitable to be tapped commercially, in four or five years the cuttings will give enough sap so that it can be tested for sugar content.

To measure the sugar content of maple sap the scientists use an instrument called the refractometer. They put a drop of sap between the glass plates of the refractometer, point the instrument away from the sun and read the percentage of sugar in the sap sample. They have measured and recorded the sweetness of sap from 4500 Vermont maple trees. The men have found trees yielding sap with a sugar content of over 7 percent. The average maple gives sap with a sugar content of from 2 to 2.5 percent, depending upon the season.

They have also found that the volume variance in sap yield is also great. Some trees have been found to give four times more sap than the average sugar maple.

The ideal strain of maple which they hope to develop would combine these characteristics of high sugar content, great yields plus fast growth.

Every farmer knows that cold nights, followed by warm days, produce a good run of sap. Weather of the preceding year may also have a lot to do with the run and the quality of maple sap. Fertility of the soil, altitude of the sugar bush and many other environmental factors play a part in determining a good maple yield.

At the Underhill farm the Vermont researchers are trying to find out just what influence each of these many factors has in sap flow and sugar content. They estimate that in the next few years they may have some of the answers they are seeking. These answers, plus the knowledge already gained from the experiments, may some day aid maple producers in producing a greater percentage of high quality maple products with less labor involved.

The Vermont Agricultural Experiment Station leads the world in both the amount of maple research completed and that planned for the future.

About 50 years ago scientists of the Vermont Agricultural Experiment Station published their first studies on the sugar maple. Since that time, much of the knowledge of the maple tree and its products has come through the efforts of C. H. Jones, Vermont Experiment Station chemist, and his coworkers.

"Today," say Drs. Marvin and Taylor , "the Vermont Station is trying to select and propagate a superior strain of sugar maple which has an abundant yield of high quality sap. We hope to find a strain of trees that will combine these characteristics with that of rapid growth.

"We are studying the effect of soil differences on maple production. We are also experimenting with soil fertility for maple orchards and cutting and thinning to find the best number of trees that should be growing per acre.

"The sap flow mechanism in the maple tree, so sensitive to temperature change, is still the maple secret. It is an important botanical problem still unsolved. But we are studying it in our maple research laboratory and making progress.

"As with most research, the answers to these problems do not come easily or quickly, but we feel that in the not too distant future, our results will help make more maple products available to all who enjoy them."

How To Manage Orchard Soils

Condensed from the American Fruit Grower

Dr. R. E. Stephenson
Oregon State College

SOIL is a major factor in successful fruit growing. The plant establishes itself with the soil through its root system, and the root system has an important job to perform.

A vigorous, healthy plant capable of setting and maturing a heavy harvest must have roots able to penetrate without hindrance, sometimes 10 to 15 feet, into the soil. Roots must be able to branch and send out feeders of fine roots profusely covered with root hairs and to make intimate contact with soil surfaces in order to withdraw those elements and the moisture necessary for good growth.

It has been estimated that the annual dry weight of growth in an orchard in full bearing, including wood, leaves, and fruit, is six tons per acre. To produce this growth some 200 pounds of nitrogen, in addition to a considerable portion of phosphorus, potassium, sulfur, calcium, iron, magnesium, copper, zinc, manganese, and boron, must be withdrawn from the soil through the root system.

These nutrient elements must be taken into the root system in combination. For example, if nitrogen were taken into the plant in the form of potassium nitrate, as part of it may be, some 1400 pounds an acre would have to pass into the root system to supply the 200 pounds of nitrogen.

Or considering only the ash of the six tons of annual growth there would be perhaps 600 pounds or more an acre which represents minerals taken from the soil. To gather all these nutrients through surface contacts between roots and soil is no small accomplishment.

The withdrawal of moisture is a bigger job yet. Using the average figure of 500 tons of water to make one ton of dry plant material, the six tons would require six million pounds (720,000 gals.) of water which roots must withdraw from an acre of soil, and this from a soil with moisture present only as a thin film on soil surfaces or in capillary spaces so small as to be invisible. Even if only one-half this amount of water were needed, the task is still huge.

Perhaps these statements may indicate the importance of having

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a good soil, well-equipped with nutrients, capable of retaining much moisture, and yet porous and permeable enough to provide good drainage and aeration, and to permit profuse development of feeding roots.

Plants have more roots than most of us are aware of. A scientist who made a study of root systems reports a single rye plant grown in the open which developed a total root length of 380 miles, including all branches and root hairs. The surface contact with the soil by such a root system was estimated at 7000 square feet, equal to a city lot of ordinary size. The roots, including root hairs, had many times as much surface as the leaf system.

A large fruit tree in good soil must have an extensive root system, though perhaps not proportionately as great as the rye plant.

In fruit production nitrogen is the nutrient element of first consideration in most soils, although deficiency of all elements must be corrected for good production. Nitrogen is the growth element and pretty much determines the size of leaves and their chlorophyll content and, therefore, their capacity for manufacturing food for growth and fruiting.

Fruiting is best when there is a good balance between nitrogen and carbohydrate within the plant. The nitrogen comes from the soil and the carbohydrate is manufactured by the leaves. The grower controls the nitrogen supply by his fertilizer and management practices. Only partially can he control carbohydrate manufacture by his planting distances, pruning methods, and fertilizer practices which influence the number and size of leaves and their exposure to the sun. For instance, crowded trees are unfruitful where branches overlap, and tree trimming sometimes becomes necessary in old orchards for good production.

Too much nitrogen in the fertilizer program may stimulate so much vegetative growth that the carbohydrate supply is exhausted which is unfavorable to fruitfulness. Also an excess of carbohydrate resulting from insufficient growth because of too little nitrogen is unfavorable to fruitfulness. The intermediate condition with enough growth for good vigor but which does not exhaust the carbohydrate is most favorable to a good harvest of high quality fruit.

Nitrogen deficiency is most common, but other deficiencies may include phosphorus, sulfur, potassium, and sometimes boron, depending upon the soil and the crop. It is important to know the deficiency in terms of the crop produced.

In western Oregon boron deficiency is common for walnuts and sometimes so severe that practically no crop is set until borax is used to correct the deficiency.

In the same area, however, boron deficiency for filberts has never been found. Thus, borax application is frequently compulsory to obtain a walnut harvest but is a waste of money and might prove injurious for filberts.

Most fruit plants are not very sensitive to soil acidity, and liming to correct any but extremely acid soils is not likely to improve fruit production. Cover crops grown for humus renewal may be in need of liming and, if so, the fruit may benefit indirectly from the increased humus renewal by the cover crop. Liming a severely acid soil does improve the general fertility for many farm crops.

Most fruit crops are rather sensitive to lack of humus renewal in the soil. Almost without exception, therefore, cover cropping and other humus renewal practices must be adopted for good fruit production.

In the greenhouse strawberries grown without fertilizer produced starved plants that set few berries and made only two harvests. Use of N-P-K-S resulted in four harvests and a fourfold yield increase. When compost was added to the above treatment, the yield was nearly doubled again. The fertilizer and compost produced more than twice the yield of fertilizer alone, indicating that both organic matter and fertilizers were needed for best results with strawberries on this soil, which was a Willamette silt loam.

Humus renewal in addition to the use of commercial fertilizers is important because of the value of humus for improving physical properties, particularly the structure of the soil. Structure has been designated the key to soil fertility. Adequate humus renewal helps soil aggregation and stabilizes granulation to prevent the soil from losing its structure and running together and cementing to such an extent that roots do not develop or function properly. Without an adequately functioning root system there can be neither satisfactory growth nor fruiting.

Humus materials also support the living organisms of the soil which are important in improving both physical and chemical soil properties. Bacteria, fungi, and other organisms break down raw organic matter to produce humus and decompose the humus itself and in so doing liberate nutrients and produce solvents that dissolve the minerals of the soil to supply the plant with what it needs. Animal organisms including various insects, larvae of insects, and larger organisms such as the earthworm, channel the soil so that a good soil becomes a system of tunnels and micro-channels through which water and air circulate and into which roots penetrate to absorb both moisture and nutrients.

Moisture in the deep soil would be useless to the plant unless roots penetrate and function deeply. The best soils can hold 2000 tons (480,000 gals.) of crop water per acre in 10 feet of root zone to carry a crop through drought periods successfully, whereas a shallow soil, or one with cemented structure, would so limit root development and functioning that fruit crops would suffer quickly in drought periods, even to the extent of dropping the fruit before maturity.

Droughts with high temperature and low humidity are especially severe on plants when the soil limits the root system. Dry air at 100° F. is capable of absorbing seven times as much water as air at 40° F., and the pull upon the plant for water is correspondingly increased. Under such conditions the foliage may withdraw water from the fruit and in extreme cases the leaves may be dropped. Without leaves there cannot be a good harvest even if the fruit should hang on.

Adequate humus renewal not only improves soil structure to the benefit of the plant, but the presence of rotting organic matter stimulates root development perhaps by supplying growth hormones, which are produced by the bacteria or other organisms causing the rotting of the organic matter.

It has been demonstrated that many soil organisms are capable of producing growth-stimulating hormones by decomposing organic matter and that these growth stimulants are present and extractable in good soils. It is also known that plants can absorb hormones from the soil.

Humus renewal as well as the use of suitable fertilizers on a well-chosen soil is, therefore, of paramount importance in fruit production. The grower must exercise vigilance to see that the system of culture is such as to maintain both the favorable physical and chemical properties that result in good growth and high production. With attention to these fundamentals, using fertilizers as needed, the way is prepared for satisfactory production over an extended period.

Curing Hay in the Stack

Condensed from Rural Electrification News

ARTIFICIAL curing of hay through the use of electrically powered blowers is rapidly becoming established as a valuable farm practice. For a steadily increasing number of farmers in the eastern States, barn hay driers are taking the weather hazard out of haymaking and producing better hay.

In western areas, however, few farmers and ranchers use barns to store hay. Free of the threat of heavy rain during haying, farmers west of Kansas City frequently leave hay in the field from 3 days to 3 weeks until it is dry enough to stack for winter use.

Unfortunately, the same fair weather that makes this practice possible also results in the production of much second- and third-grade hay of relatively low value for feeding or cash sale. Brilliant sunshine, with ultraviolet light passing through thin air, fades the hay during the drying period. This lowers carotene and vitamin A content. Hot days wilt the leaves too rapidly. This results in excessive leaf shattering in handling and high moisture content in the stems. Heavy dews and light showers greatly increase vitamin and color losses and leaf shattering.

If the hay can be stacked as soon as it is cut, the effect of these conditions is largely avoided. Immediate stacking becomes practical when forced air is used to dry the hay in the stack. With an electrically powered fan and a temporary electrical connection into the field, it appears that the western hay maker can get a better product by using the outdoor equivalent of the barn hay drier so popular with his neighbors farther east. In fact, stack drying could be used in more humid climates if stack covers were provided for protection from weather after curing was completed.

During the last 2 years, successful field demonstrations have been conducted in Colorado and Wyoming in artificial curing of alfalfa hay stacked within 24 hours after it was cut. Tests were made with long hay, chopped hay, and baled hay. The demonstrations were made by REA engineers in cooperation, in 1947, with Colorado A. and M. College and the Poudre Valley Rural Electric Association of Fort Col-

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lins. The 1948 demonstrations were made with the San Luis Valley Electric Cooperative and the Mountain View Electric Association in Colorado and with the Wyrulec Co., an REA-financed cooperative at Lingle, Wyo., and the University of Wyoming.

Drying Long Hay

Method: Hay was picked up from the windrows by a tractor-mounted buck rake, and stacked by an overshot haystacker. The stack was built over an A-shaped frame 8 feet wide at the bottom, 2 feet wide at the top, 7 feet high and 10 feet long. The stack dimensions were 22 by 22 by 14 feet when completed, but it settled 2 feet in drying. An air seal was formed by 6 feet of hay on the sides, 4 feet on the fan end of the stack and 6 feet on the opposite end. (The extra 2 feet opposite the fan were necessary to hold the air pressure.)

A 5-horsepower single-phase electric motor was used to drive a 36-inch multiblade propeller fan delivering approximately 16,000 cubic feet of air per minute. This is much more air than was needed for this small stack but the equipment was planned so that the rancher could use it on much larger stacks later. Fifteen cubic feet of air per minute per square foot of stack area is the minimum air volume recommended. The system was designed so that air pressure would be maintained at 0.75 of an inch of water (enough pressure to hold up a column of water three-fourths of an inch high). Pressure-measuring equipment was used to check this.

Results: The estimated moisture content of this hay at stacking time was 45 percent. It required 14 days to cure it to approximately 10 percent moisture content. The fan was operated continuously during the first 5 days of this period and thereafter during daylight hours only. When cured, the hay graded U. S. No. 1, Very Leafy, Very Green Alfalfa Hay. The cured hay was found to have 50 percent of leaves by weight and 80 percent color retention.

In later demonstrations with long hay, more attention was given to obtaining an air seal at both the fan end and the opposite end of the stack. Also, the A-frame was widened at the top from 2 feet to 6 feet. This gave more uniform air penetration in the hay above the 7-foot level in the stack.

Drying Chopped Hay

Method: The frame for curing chopped hay in the stack was of the slatted floor type, and was made in the shape of a very shallow and wide-spread inverted V. This slatted floor was 11 feet

wide by 29 feet long, and 44 inches high in the center. The stack was formed by placing two strips of wire hog fence one above the other around the sides of this floor. This confined the hay over the floor and formed a straight-sided rectangular stack. Posts at the corners and along the sides held the fence in position. The inside of the fence was lined with building paper to prevent air loss.

The stack was made 4 feet wider than the slatted floor, giving an air seal of 2 feet of chopped hay along each side. The stack was also made 4 feet longer than the slatted floor, allowing a 2-foot chopped hay air seal at the fan end and the same seal at the end opposite the fan. Total depth of the hay as stacked was less than 9 feet and it settled to about 8 feet. Stack dimensions were 15 by 33 by 8 feet when cured. The stack was estimated to contain about 12 tons of cured hay.

Again 15 cubic feet of air per minute per square foot of stack area was considered the minimum volume of air needed for quick and satisfactory curing. A 5-horsepower single-phase motor and a 36-inch multiblade propeller fan were used to force air into the stack through the slatted floor.

Results: The demonstration with chopped hay was hampered by unpreventable delays for machinery repair. As a result, cutting, raking, field chopping from windrows and stacking occupied 3 days. Even under these conditions, quite satisfactory cured hay was produced. For best results, it appears that the hay should be cut and stacked the same day if the moisture content can be reduced to 45 percent or less in the swath by early afternoon.

Drying Baled Hay

Method: The outstanding demonstration test was made by artificial drying of a 35-ton stack of *baled hay.* The hay was cut in the morning and raked when the moisture content was below 45 percent. Baling started at once, using a field pickup baler.

The stack was started when the first load of bales was completed. The stack was formed in the usual manner for stacking baled hay. The first layer of bales was placed on edge to prevent the metal bale ties from rusting and breaking in handling when the stack was fed out. All other layers were placed flat. Since air was to be forced into the stack the bales were placed so that a central air space 4 feet by 4 feet by 25 feet was left down the center of the stack at ground level. Five rows of bales placed lengthwise were laid on each side of the center duct. This made a stack 16 feet wide, the length being about 34 feet. Each row was staggered a half bale length to break the joints between bales

and to prevent excessive loss of air through the cracks between bales.

When three layers of bales had been placed, the duct was approximately 4 feet high. Two-inch by 6-inch planks were then laid on the bales across the duct. This permitted the placing of bales over the duct to close it and form the air seal. To close the duct at the stack end opposite the fan, eight staggered rows of bales were placed across the stack in the same manner as along the sides of the duct. This sealed the duct, forcing the air to escape through the cracks between bales.

Space between bales was approximately 1 inch. Since the bale rows were staggered the air could not pass directly out of the stack but followed a zig-zag path. This enabled the fan to maintain the necessary pressure for even distribution of air. At the same time the air could escape in sufficient volume to remove the heat and moisture, thus curing the hay. After the third layer, each layer of bales was drawn in a half bale width along the sides. This permitted the stack to be topped out when it was 11 bales high.

To prevent air loss between the fan and stack a wooden duct 4 feet by 4 feet by 8 feet long was inserted in the stack at the fan end. A canvas collar 2 feet wide was tacked around the fan frame and on the inside of the wooden duct. This prevented any loss of air at the fan end. Air pressure of 1¼ to 1½ inches of water was maintained throughout the entire curing period when the fan was operated.

The fan was started when the duct was covered with one layer of bales, and operated continuously for a week. It was then operated for 7 more days during daylight hours only.

A 7½-horsepower single-phase motor was used to drive a 48-inch multiblade fan. Approximately 23,000 cubic feet of air per minute at a pressure of 1½ inches of water was blown through the stack. A minimum of 20 cubic feet of air per square foot of stack area is recommended as the minimum for safe curing of baled hay. On this basis, the equipment used in this demonstration could have been used for a stack containing up to 70 tons of hay.

Curing observations: The flow of air from the main duct through the cracks between bales was carefully observed during the test. This check indicated that air was escaping from all the cracks with approximately the same velocity and that no hot air, indicating hot spots in the stack, was present at any point. Pressure measuring equipment indicated that a pressure of 1½

inches of water was maintained for one week inside the air chamber, and then dropped to 1¼ inches—a loss of only a quarter inch of pressure due to bale shrinkage.

As the air passed through the stack it picked up the heat formed and removed the moisture from the outside layers of each bale. The moisture and any heat in the bale apparently travelled by diffusion and conduction from the inside to the outside of each bale where the air picked up and removed both. The fan was first started 2 hours after stacking began, and the escaping air was very hot, reaching temperatures as high as 120° F. After the first 2 hours, temperatures of escaping air were always 4° to 12° less than the temperature entering the stack at the fan. In fact the air felt cool to the hands when inserted between the bales.

This temperature difference indicates that the heat in the stack was removed as fast as it formed. It also means that the air was evaporating moisture, which resulted in lowering the temperature of the air as it passes through the stack. When the hay inside the stack felt cold to the hand it was a sure sign that curing was progressing. When intake and escaping air were of equal temperature it indicated the hay in the stack was practically cured. Since the outside layer of bales is always last to dry, the fan was operated until those bales appeared to be dry and no heat was indicated inside them.

Results: At the end of 14 days, the baled hay graded U. S. No. 1 Very Green Alfalfa Hay. It fell a few percentage points short of grading Very Leafy, but this was the result of advanced maturity at cutting time. Following is a chemical analysis and grading summary for the cured baled hay:

	Percent
Moisture content	9.5
Leaves by weight	45
Color retained	78
Carotene retained	34.4
Ash	9.18
Phosphorus	.605
Calcium	2.35
Ether extract	3.83
Crude fiber	27.74
Crude protein	16.65
Nitrogen-free extract	36.12

Note.—Moisture content shown above was for stack-cured hay. The chemical analysis is based on air-dry weight averaging 6.49 percent moisture.

Precautions

A few precautions had to be taken in this new process. The first was to see that the moisture content of the hay was below 50 percent when raking started. The second was to place the hay uniformly over and around the air chamber frames to form an air seal that would not permit loss of air pressure at a thinly covered spot. With full length or chopped hay, as little tramping as possible was done; but what had to be

done was made as uniform as possible. The third precaution was to examine the stacks to see that the air was escaping uniformly from the stack and was cool at all points. If too much air escapes at one place, the operator can enter the air chamber by stopping the motor and moving the fan. Canvas or grain sacks can then be placed over the corresponding surface inside the air chamber where the pressure loss is found on the outside of the stack. The canvas or sacks retard the air at the thinly covered spot, forcing the air to pass out through the other parts of the stack.

Power Consumption

The amount of power consumed in stack drying will depend on the moisture content of the hay when stacked and when drying is completed; the method of making hay, i.e. long hay, chopped, or baled hay, and the climatic conditions such as air humidity and temperature during the curing period. The drier and hotter the weather, the faster the hay will cure. Rapid curing is necessary for the highest quality and feed value when artificial curing is done.

Power consumption can be expected to vary from 40 to 100 kilowatt-hours per cured ton. In the demonstrations described, the maximum power required was 87 kilowatt-hours per cured ton for the chopped loose hay. In this case, the demonstrators were of the opinion that curing was accomplished with about 600 kilowatt-hours, or 50 kilowatt-hours per ton, and that the rancher was overcautious in continuing fan operation. The baled hay required only 42 hours per cured ton, but this record was unusual, since baled hay curing would generally require more electric power per ton than long or chopped hay.

Field equipment ordinarily used for cutting, raking, gathering, and storing hay may be used with few, if any, changes for stack drying.

Commercial Broiler Production

Condensed from American Poultry Journal

Mack O. North

TWENTY years ago, practically all of the frying chickens consumed in the United States were produced as by-products of farms raising pullets for laying purposes.

Now, the situation is vastly changed, for well over 300 million broilers and fryers are produced commercially each year. These birds are produced in large groups of mixed sexes, and with commercial methods. Many methods of management have been exploited in the production of commercial broilers. In this particular discussion, however, we shall consider only the "floor" method of brooding.

By commercial floor production, we are talking about large operations of from 5,000 to 20,000 birds. Most operations of this type have at least 5,000 birds, and for full time occupation, at least 10,000 birds. This is certainly big business for some plants have as high as 200,000 birds on feed at one time. Methods of management are precise and business-like. Certain types of chicks are used, specialized feeds are fed, up-to-date management programs are followed, and a quality product is produced.

To be successful, it is necessary to know something about the costs of producing a broiler. These might be listed as follows:

Buildings and Equipment	4.2%
Fuel	2.6
Sanitation	1.3
Litter	0.3
Chicks	18.6
Feed	61.4
Labor	11.6
	100%

These figures were taken from averages of several cost studies made in broiler sections throughout the United States. Note that feed represents the largest single item in the list, with chick cost and labor cost second and third respectively. Deducting labor from the above list, you will have the following distribution:

Feed	70%
Chicks	20
Other Costs	10
	100%

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These figures indicate clearly that feed represents the largest factor in production costs, and special emphasis should be placed on good feed, in order to get economical meat production. Although correct litter, proper fuel, and other items are important, they are more or less minor when considered along with a major factor like feed.

Other factors help determine profits. There must be sufficient floor space. From 2/3 to 1 sq. ft. floor space for each chick must be furnished. When growers crowd beyond this limit, they seriously decrease growth, increase mortality, and decrease feed efficiency. Usually hovertype brooders are used, but more modern methods now utilize hot water heating systems or even radiant heat.

The "all in-all out" system of management seems to be best adapted to commercial production. This program means that all the chicks are placed in the house at one time—that is, the house is completely filled, and when the birds are old enough to go to market, they are sold at one time.

This gives about a week between broods to clean the premises so as to start the next group of chicks with a clean bill of health. Generally, a weekly or successive system of management does not work so well. If a disease enters the flock under this type of program, every group of chicks coming along will contract this disease at their susceptible age, and one way of getting rid of certain respiratory diseases is to depopulate the premises. When one is on a weekly system of chick replacements and has to depopulate, it means that it takes 10 to 12 weeks to get out of business, a week to clean up, and 10 to 12 weeks to get the plant into full operation again.

If the commercial broiler farm is to be profitable, there must be sufficient volume. One man can easily care for 10,000 birds, and many plants have 18,000 to 20,000 birds, with one person operating them.

The following table shows how important it is that death losses be kept under 10%.

DEATH LOSS AND PROFITS

Per Cent Mortality	Net Profit per Pound of Meat
Under 5%	6.2c
5–10%	5.9c
10–15%	4.3c
15–20%	2.4c
20–25%	1.6c
25% and over	—0.4c

The difference between 10% or less mortality and 25% and over, is near 6c a pound. On a 3 lb. bird, this would be 18c—a factor which more than determines the difference between a profitable or losing enterprise.

For best results and larger profits, it is necessary that a year-round program be used. It normally requires only 11 or 12 weeks to produce a 3-lb. commercial broiler. By taking a week between broods, 4 broods can easily be raised a year. In the early days of broiler production, too many folks were raising only a spring brood of chicks. This was not because it was unprofitable the rest of the year, but because day-old chicks were not available.

Nowadays, however, hatcheries are specializing in the production of commercial broiler chicks and are operating 12 months of the year. When 4 broods a year are kept, the overhead can be spread over 4 times as many chicks. There is also a better utilization of labor. There is better equalization of profit, for it is much easier to hit some of the good markets if 4 broods are being sold than if only one. Most farms are now incorporating labor saving devices into their management program to reduce production costs. The following table shows the results encountered by broiler farms, which were classified as high, average and low efficiency. Those classified as high had many labor saving devices, and those classified as low had few.

These results show that labor cost can be more than cut in 2 by installing labor saving devices. Such things as automatic waterers, automatic heating units, and even automatic feeders are now being used. The litter is changed only between broods, and consequently all the operator has to do is put all of his automatic gadgets in operation. This makes it possible for one man to care for 20,000 or more birds.

EFFICIENCY AND COST OF LABOR PER POUND

Efficiency	Labor Cost per Pound of Meat
High (Many Labor Saving Devices)	2.3c
Average	4.0c
Low	5.8c

Fast growth is essential for economical production. Rapid gains mean that more chicks can be raised per year. Also, there will be a more rapid turn-over of capital, less labor, and low mortality. But of greatest importance is the fact that chicks which grow and mature rapidly require less feed per pound of meat than those which grow slowly.

Feed represents nearly two-thirds the cost of raising a broiler. Some feeds will produce a pound of meat more efficiently than others, but only by feeding can one evaluate the cost of producing a pound of broiler meat on any one particular ration. However, a good broiler feed should produce at least 30 lbs. of broiler

meat per 100 lb. bag, or even more.

A difference of 3 lbs. of meat per pound of feed, or the equivalent of one 3-lb. broiler, would mean the difference of around $1 more meat sales per bag. This evaluation of "meat sales per bag" should be the determining factor in selecting a feed. The value of each additional pound of meat per bag is shown in the table below:

ADDITIONAL MEAT PER BAG

Extra Pounds Meat per Bag	Reduction in Feed Cost per Pound Broiler
1	1.2c
2	2.4c
3	3.5c
4	4.8c
5	5.9c
6	7.0c
7	8.2c

Regardless of what type of management program is followed, or any other variables involved in the broiler production program, the producer must have one goal in mind, and that is, to produce a superior product. If the consumption of broilers is to increase in the years ahead, it is absolutely necessary that only a superior product be made available for the consumer. This applies whether the birds are sold in cut-up, eviscerated, or New York dressed style.

The above profit essentials and cost determiners are the chief points to keep in mind on any broiler farm. They must be stressed and stressed again, if the program is to be profitable over a period of ten years. To sum it up—a good broiler program should include:

A good broiler chick
A good management program
A good sanitation program
A good feed
A good product

Failure with any of these will mean that the broiler grower is not realizing his greatest profit.

Ramie's Debut

Condensed from the Wall Street Journal

Laurence E. Hartmus

RAMIE, the fibre which clothed Egypt's Pharaohs thirty centuries ago, is about to make a full-fledged debut in U. S. textile circles.

Heavy plantings of the nettle-like shrub, which produces ramie fibre, have been, or soon will be, made in California and Florida; that assures an increasing supply of raw material. New processing methods and spinning machines have been devised which will produce fine diameter threads suitable for weaving into scores of textiles.

Ramie is the toughest of all vegetable fibres—several times stronger than cotton. It has a high immunity to shrinkage, mildew and abrasion. The threads which it produces are as soft as linen and shine like silk. It can be combined easily with other fibres and textiles, like cotton and rayon. The plants from which the fibre comes are perennials, with a life of 20 to 30 years. They grow rapidly—an inch a day—and produce three or four crops a year.

Why then hasn't ramie long since been at the top of the textile heap?

Because processing the raw fibres until lately has been extremely difficult, by machine, and costly when done by hand: and, secondly, because machinery used for spinning cotton or wool would not work on ramie, or would work with only partial success.

Ramie fibre grows underneath the bark of the shrub's stalk. To make it usable, it first must be separated from the bark (decorticated) and then cleansed (degummed) of the resinous gums in which it's imbedded. The resultant fibres are much too long—4 to 20 inches, compared with cotton fibre's 5/8 to 1 1/3 inch length—to be spun on ordinary cotton machines, although coarse yarns can be produced on wool or worsted spinning machinery.

For nearly a century, hundreds of textile men in this country have tried to find ways to overcome these difficulties, and the history of the fibre is cluttered with their failures. Speculators, too, frequently have promoted

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ramie's unusual qualities as a lure for unwary investors—to the latter's financial sorrow.

In Europe, where labor was cheaper, a small ramie industry was built up in coarse-woven products. Companies in Germany, France and England made things like fire hose, parachute cords and similar heavy materials. But they, too, had little luck in converting ramie into finer textiles. Their only source of supply was crude, hand-decorticated ramie from China, known as "China Grass."

Within the last year, however, U. S. ramie researchers in California, Florida and Texas, have solved nearly all these processing problems.

Harvesting and decorticating machines have been invented. The newest of these gadgets, operated by eight men, can cut and strip out 1,000 to 1,500 pounds of fibre in an hour. Before it was developed 40 men worked a full day to decorticate 1,000 pounds.

These machines, of which there are several types, work on more or less the same principle. Ramie bushes are sliced off even with the ground and pulled into the machine which strips leaves from the stalk. The latter then is broken into short pieces, run through rollers or pounded by rotating bars until the woody portion is freed from the fibres. The process merely mechanizes the old Chinese hand method of pounding the stalks with stones until the fibres were loosened.

One successful decorticator has been invented by Leone Plantations, Inc., of Teague, Texas. A newer and faster one has been developed by Mohegan Fibre Equipment Corp. of New York. It can handle 26 tons of green ramie an hour. Sea Island Mills has perfected a 15-ton mammoth—34 feet long, 10 feet wide—called the "Siland Combine Decorticator."

Successful commercial-scale degumming methods also have been worked out—and kept closely guarded secrets—by several producers. Instead of soaking the fibre in water, as did the Chinese, acids and other caustic chemicals are used to loosen the gum and bleach the ramie.

The fibre division of Newport Industries, Inc., a leading naval stores concern which has planted 1,200 acres of ramie in Florida, is installing a degumming plant and in 1949 plans to degum all its output. This company produced a million pounds of decorticated ramie this year in spite of a hurricane which destroyed nearly a third of its crop.

Newport Industries will plant another 300 acres next year, as an addition to the 10,000 acres of ramie now being grown in the deep south by textile companies and individual farmers. Most of this acreage is in Florida, where the alluvial mucklands of the

Everglades makes ramie growing nearly ideal. This nucleus of a stable American-grown source of supply is the result of a two-year research program conducted by the U. S. Department of Agriculture and the Florida State Agriculture Department in conjunction with textile companies.

In Texas, Leone Plantations, Inc., which 15 years ago pioneered ramie growing in the U. S. by importing root stock from the Orient, plans to double its present supply by 1950. At present, the firm has 40 acres in root stock, enough to plant 3,000 acres. Ramie is propagated by splitting the roots and replanting.

The newest field for ramie's development is in California. International Ramie Co., of San Francisco, after two years of experimental planting on irrigated land in conjunction with Shell Chemical Co., last spring supervised planting by California farmers of its first commercial root stock, which will be used soon to plant 300 to 500 acres.

Even greater progress has been made recently in the final stage of ramie processing—the spinning and weaving of fine thread.

International Ramie Co. this year for the first time produced fine diameter ramie thread on modified cotton machinery. Attempts to spin high number count ramie on conventional long draft spinning equipment used in most U. S. cotton mills have been made frequently, but never successfully. International, by making a number of technical changes in the long draft system, evolved and patented what it calls the "Hi Draft" spinning machine.

In its pilot plant production, International turned out ramie thread up to No. 80 count—four or five times the maximum fineness achieved previously—and did it more economically than ordinary cotton spinning processes. This operation, International's officials claim, opens to ramie the fine-woven fabric fields which up to now have been dominated by linen and cotton.

Thread count is based on the number of 840 yard lengths required to weigh a pound. No. 16 cotton count, for instance means 16 lengths to a pound. No. 80 count means 80 lengths per pound, and so on. The higher the number, the finer the thread.

Early next year, International Ramie Co. will build a $2 million, 11,616-spindle spinning and weaving mill in California's San Joaquin Valley. At first the company will produce ramie thread No. 35 and No. 40 count for weaving into bed sheets and pillow cases, and No. 80 two-ply thread (equivalent to No. 40 single ply) for broadcloth. The mill is expected to go into production next fall with an initial output of 1,000 bed sheets a month; eventual capacity is plan-

ned at 12,000 sheets monthly, when the raw ramie supply is ample enough to sustain that size output.

Ramie bed sheets, says W. E. Clayton, president of International Ramie Co., are comparable to pure linen sheets in durability, softness and texture. Ramie fibre has about four times greater tensile strength than flax, from which linen is made, and is twice as elastic. Ramie sheets weigh about one and a half pounds each; linen sheets about two pounds. "And," adds Mr. Clayton, "Ramie sheets are cooler in summer and warmer in winter than either cotton or linen."

In addition to progress in the fine-woven textile field, ramie fabrics made from coarser yarns, spun on wool machinery, promise more active completion with wool and worsted suitings and similar textiles.

Sea Island Mills Co., of New York, which has been working with ramie since 1944, last year brought out ramie jackets, and this year introduced ramie slacks, dresses and shirts. Next year it plans to make suits of ramie. Sea Island successfully experimented with half-and-half mixture of ramie and cotton, and ramie and rayon.

All these developments don't mean King Cotton is going to be toppled from his throne.

For one reason, ramie is quite a bit more costly than cotton. For example, a pair of ramie bed sheets and a pair of pillow cases are expected to retail at about $25 for the lot, compared with around $8 for a similar number of ordinary cotton sheets and pillow cases and $10 to $14 for percale (extra fine woven cotton) sheets and cases. But, compared with $29.95 for a single pure linen bed sheet, ramie will be a bargain.

Ramie producers are aiming to tap a market among people who want something a little better than cotton goods, and are able and willing to pay for it.

Another factor in the cotton vs. ramie picture is comparative cost of raw material. Degummed ramie fibre at present brings around 80 cents a pound; cotton is about 31 cents, but, say producers, that's partly because of ramie's scarcity rather than actual cost of production. On a volume basis, International Ramie Co. estimates it can produce ramie for 30 cents a pound—20 cents for growing costs, 10 cents for decorticating and degumming.

And, of course, the present comparatively infinitesimal ramie acreage— 10,000 to 11,000 acres compared with more than 23 million acres of cotton—means that the former is only a very small drop in the textile trade bucket.

How fast the industry grows will depend on development of new spinning and weaving mills.

That will be expensive. Converting conventional cotton machinery to the "Hi Draft" system runs around $350,000 for a 10,000-spindle mill. However, the initial expense is offset partly by the fact that "Hi Draft" machinery can be operated at 16% less cost than cotton equipment.

Once there are enough mills to lure farmers into planting ramie, they'll find it an easy and profitable crop to grow, say present producers.

The shrub's dense leafage shades the ground and deters growth of weeds, eliminating back-breaking hoeing. It has to be planted only once every 20 or 30 years, and all harvesting is by machine.

The yield of decorticated fibre per acre is about 1,800 pounds from 30 tons of green ramie. For some areas in the south this would mean ten times the yield of cotton.

In the south ramie growers have received $3.75 a ton delivered for the total green product —stalks and leaves. From an average 30 tons per acre that means a return of over $110 compared to less than $70 for cotton planted on the same land.

On the more costly irrigated ramie land in California, International Ramie Co. counts on paying farmers $6 a ton for the green product, totaling about 45 tons to the acre, or a return to the farmer of $270. Cotton returns in California average from $175 to $200 per acre.

One drawback for the farmer is the high initial cost of preparing and planting the land—this is estimated at from $90 per acre on the west coast to as high as $200 in the south. In California it's estimated to cost $95. Adequate fertilization—ramie is a heavy consumer of soil nutrients—is often another cost headache. In California the problem has been solved by the use of liquid fertilizers fed to the soil during irrigation.

An important phase of ramie growing may lie in by-products. The shrub yields, in addition to its fibre, about 3 tons per acre of meal made by grinding up the leafy tops of the plant. This meal makes excellent livestock feed because its protein content is 24% compared with 21.1% for alfalfa. Newport Industries, at present the only producer of ramie leaves, turned out several hundred tons of dehydrated meal during the 1948 season.

Newport Industries also plans to recover and produce a ramie fibre waste for the paper making trade.

Residue of the degumming process used by International Ramie Co. is a liquid soap with possible commercial uses.

Other by-product possibilities include a cooking sauce similar to soy sauce which employs ramie

ned at 12,000 sheets monthly, when the raw ramie supply is ample enough to sustain that size output.

Ramie bed sheets, says W. E. Clayton, president of International Ramie Co., are comparable to pure linen sheets in durability, softness and texture. Ramie fibre has about four times greater tensile strength than flax, from which linen is made, and is twice as elastic. Ramie sheets weigh about one and a half pounds each; linen sheets about two pounds. "And," adds Mr. Clayton, "Ramie sheets are cooler in summer and warmer in winter than either cotton or linen."

In addition to progress in the fine-woven textile field, ramie fabrics made from coarser yarns, spun on wool machinery, promise more active completion with wool and worsted suitings and similar textiles.

Sea Island Mills Co., of New York, which has been working with ramie since 1944, last year brought out ramie jackets, and this year introduced ramie slacks, dresses and shirts. Next year it plans to make suits of ramie. Sea Island successfully experimented with half-and-half mixture of ramie and cotton, and ramie and rayon.

All these developments don't mean King Cotton is going to be toppled from his throne.

For one reason, ramie is quite a bit more costly than cotton. For example, a pair of ramie bed sheets and a pair of pillow cases are expected to retail at about $25 for the lot, compared with around $8 for a similar number of ordinary cotton sheets and pillow cases and $10 to $14 for percale (extra fine woven cotton) sheets and cases. But, compared with $29.95 for a single pure linen bed sheet, ramie will be a bargain.

Ramie producers are aiming to tap a market among people who want something a little better than cotton goods, and are able and willing to pay for it.

Another factor in the cotton vs. ramie picture is comparative cost of raw material. Degummed ramie fibre at present brings around 80 cents a pound; cotton is about 31 cents, but, say producers, that's partly because of ramie's scarcity rather than actual cost of production. On a volume basis, International Ramie Co. estimates it can produce ramie for 30 cents a pound—20 cents for growing costs, 10 cents for decorticating and degumming.

And, of course, the present comparatively infinitesimal ramie acreage—10,000 to 11,000 acres compared with more than 23 million acres of cotton—means that the former is only a very small drop in the textile trade bucket.

How fast the industry grows will depend on development of new spinning and weaving mills.

That will be expensive. Converting conventional cotton machinery to the "Hi Draft" system runs around $350,000 for a 10,000-spindle mill. However, the initial expense is offset partly by the fact that "Hi Draft" machinery can be operated at 16% less cost than cotton equipment.

Once there are enough mills to lure farmers into planting ramie, they'll find it an easy and profitable crop to grow, say present producers.

The shrub's dense leafage shades the ground and deters growth of weeds, eliminating back-breaking hoeing. It has to be planted only once every 20 or 30 years, and all harvesting is by machine.

The yield of decorticated fibre per acre is about 1,800 pounds from 30 tons of green ramie. For some areas in the south this would mean ten times the yield of cotton.

In the south ramie growers have received $3.75 a ton delivered for the total green product —stalks and leaves. From an average 30 tons per acre that means a return of over $110 compared to less than $70 for cotton planted on the same land.

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protein, wheat gluten and sugar bagasse to yield an amino-acid salt; separation of ramie gums into waxes and low methoxyl pectins for industrial and medicinal purposes; and extraction of proteins from the meal for use in industrial plastics. This can be done under a process which leaves a third of the protein still in the residue, which can be used as a cattle feed mix.

Sheep Get Buzz Bombed

Condensed from the California Farmer

THE first time we heard of dusting livestock by plane the venture was not very successful. The first instance was that of a helicopter which gave a corral full of cattle such a fright that they went right over the top of the corral.

Now we have a reportedly successful attempt by the C. C. Hoover Farms at Medford, Oregon, to dust both cattle and sheep by plane. They put about 2000 sheep in a long lane, 40 feet wide and at a height of about 25 feet released a 10 per cent DDT dust at the rates of 40 pounds per acre on the first pass and 100 pounds per acre, the second pass.

The sheep were inspected by W. B. Tucker, county agent, and he reported that in 36 hours no live ticks could be found on the animals—some of them in full fleece.

They dusted about 25 yearling bulls by simply bunching them in a corner of the pasture and making a pass at them with the plane. The bulls ran like the dickens but they got dusted anyway. A count before the dusting showed each animal to be carrying several hundred horn flies. In two hours time no horn flies were found, in 18 hours time about five flies per head were found on each animal.

At the conclusion of the experiment the suggestion was made that a 10 per cent emulsified oil DDT spray be tried to see if a greater residual amount of spray material could be deposited on the animals.

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Firewood, the Orphan Fuel

Condensed from Home Desirable

Duane Featherstonhaugh

MAN has never lost his liking for an open fire. Psychologists explain that this deep-rooted feeling can be traced to the days when fire protected early man from his enemies and kept him alive during winters and glacial periods.

Today, the open fireplace forms an ideal meeting place for the family. A cheerful, crackling blaze adds warmth to conversation or entertainment and provides the proper atmosphere for reading or quiet study. This is particularly true in the late spring and early fall when nights are chilly and coal furnaces are not in operation. At such times the fireplace is not only the most popular spot in the home but a valuable adjunct to regular heating systems.

A fireplace is a relatively inefficient heating device, for almost 50 percent of the available heat from the fuel is dissipated up the chimney. Installation of any one of several heat circulators on the market reduces the loss by a claimed 40 to 60 percent, but that still leaves a substantial loss of heat. Consequently, the more a home owner knows about various types of wood and how to buy it, the more enjoyment and benefit he will receive from his fireplace.

The price of wood, roughly $25 to $30 a full cord, is high when compared with coal. Considering the small amount used in the average home or apartment fireplace—seldom more than two to three full cords a year—and the comfort and pleasure derived, the money paid for it is well spent.

Heat investigators at the New York State College of Agriculture at Cornell University, Ithaca, in a 1942 survey, found seven woods that provided 90 percent of the heating value of hard coal. These were black birch, hickory, ironwood, locust, swamp white oak, and shadbush.

If heat is your primary reason for maintaining a fireplace, try to get one of these woods when you place your order with your dealer. You'll probably get ironwood, one of the most common of the so-called weed trees. And, ask for well-seasoned wood. All of the

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90 percent class woods burn with a hot, low flame, building up a bed of coals.

Listed as second class woods, giving 80 to 89 percent the heat of coal, were beech, yellow birch, hard maple, rock oak, oak and white ash. In the 70 to 79 percent woods were gray and white birch, elm, soft maple, sycamore and tamarack. The pines and hemlocks—the evergreens—fell in the 60 to 69 percent woods while basswood, butternut, poplar and other woods frequently used as fireplace wood were found to have less than 60 percent the efficiency of coal.

Selecting the proper wood for your use is not strictly a matter of its efficiency. Woods such as hemlock, pine and spruce and basswood burn with a bright, cheerful, crackling flame and are the ideal choices when the fireplace is primarily the gathering place for the family or a party and is not needed for sustained heat. The hickories and ironwoods give almost twice as much heat per pound but are not nearly as cheerful.

Low percentage woods are consumed more rapidly than the harder woods so it is necessary to have a better supply on hand. The cost, however, is usually below that of top-quality wood fuel.

The popular white birch combines some of the characteristics of both the hard and soft woods. It burns cheerfully and moderately quickly, but also leaves a bed of coals that provides a fair amount of heat. Because of its attractive appearance, it probably is the best buy for the householder who rarely lights a fire but who always likes to have one laid for special occasions. Because of the demand for white birch, however, it usually costs as much as the best quality woods, so it is not a good buy if the fireplace is in constant use.

Basswood is another soft wood that burns with a crackling flame. In addition it has a delightful woodsy smell that adds atmosphere to a lodge or playroom.

Make certain the wood you buy is well-seasoned. Green wood may sizzle atractively but it gives five to 10 percent less heat than dry wood and it coats the chimney with creosote. Well-seasoned wood—that which is thoroughly dried—used in a fireplace with a good draft will rarely form creosote.

There are two things you can do to make certain that your wood is right. First, select a reliable dealer. Second, order your wood several months in advance, specifying exactly the kind and the amount you want. In that way you'll get the right amount of the wood best suited to your needs.

The Cost of Not Using Lime

Condensed from the Michigan Farmer

James A. Porter
Dept. of Soil Science, Michigan State College

SUPPOSE you sow alfalfa, clover or sweet clover on a field that needs lime. Probably you would not try this if you knew there was a need of lime, but maybe you've forgotten how long it has been since you limed that field before and do not realize that lime is needed. How much does it cost not to use lime?

I have asked a number of farmers about this and talked with the men at the college.

Here is our cost list. We figured it for a sandy loam soil testing strongly acid, pH 5.0, first for the case where lime is used. Alfalfa seed, 7 pounds, $4.90; inoculation for alfalfa seed, 7 cents; brome grass seed, 5 pounds, $2.15; commercial fertilizer, 300 pounds of 0–20–20, $8.93; and limestone meal, 2½ tons, $8. Total, $24.65.

The limestone was figured on the spread basis. No allowance was made for the cost of preparing the soil and seeding. The $8 for hauling and spreading of the lime is an average for several communities.

Since the limestone was, in this case, applied the previous year, before corn, it has had time to act. Enough fertilizer is being used. The seed is the best, northern grown and inoculated. If a good job of seeding is done, there is almost sure to be a good hay crop. That probably means 2½ tons of hay the year after seeding, worth at least $40.

Now suppose the farmer tried to economize. Maybe he applied lime on this field 10 years ago and guesses that none is needed now. Or perhaps the test shows almost enough lime and he takes a chance. Anyhow he didn't get that lime on. The cash outlay for the seeding is less by $8 per acre by omitting the lime application. The seed, inoculation and fertilizer cost $16.65 per acre. What will happen? Probably one of 2 things; the seeding fails completely or it is just good enough so the farmer leaves it. In the case of crop failure perhaps the blame is put on dry weather, maybe on wilt, maybe bugs, maybe the blame is put on the companion crop of oats smothering out the alfalfa.

Let's figure the salvage value

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on the failure of this seeding. The alfalfa seed cost, $4.90; inoculation, 7 cents; and brome grass seed, $2.50. None of these items have any salvage value. Commercial fertilizer cost was $8.93. Salvage value from this was $4.47. About half the value of this fertilizer may remain for following crops. So, the total cost was $16.65, and total salvage value $4.47. This is a net loss of $12.18 per acre.

Saving $8 per acre by not using lime cost the farmer $12.18 per acre. Instead of hay he probably will grow some other crop next year which isn't likely to be worth as much as the hay. That would be more loss.

Now let us look at the case where the seeding doesn't quite fail. The farmer decides to leave it for hay. In June he cuts 1½ tons of hay, weak on alfalfa—strong on weeds. It isn't worth more than $15. He gives up and plows the field for wheat and there is another loss of at least $25. Charged against the $8 we saved on lime this $25 is for the hay which he did not raise. Not much salvage value left from the fertilizer; maybe $2.50.

In this second case he lost $14.15 on the original cash outlay plus $25 in hay leaving a net loss of $39.15 per acre because he didn't spend $8 for lime. It would have been better if the seeding had been a complete failure as in the first case.

A test of the soil would have shown this acid condition. The test would have cost but little. A 25-cent testing kit available at your county agent's office will show the lime need quickly and easily, right in the field. You can do the testing yourself by following directions. Also, you can send or take soil samples to your county agricultural agent's office and have them tested at very little cost.

Often the soil test report is a surprise to the farmer—a pleasant one. This is the case of a farmer who is braced for a cash outlay for lime. He has the soil tested, or tests it himself, to find how much lime per acre is needed, and finds that no lime is needed. He saves between $6 and $12 per acre.

If soils are not acid do not apply lime. Liming soils that test very slightly acid, neutral or alkaline, may reduce yields. This has been seen in Michigan in connection with sugar beets, table beets, small grain, beans, peaches and other crops. This is because an excess of lime upsets the availability and balance of phosphorus, potash and such micro-nutrient elements as manganese and boron.

There are many forms of lime, equally good for neutralizing soil acidity. Lime recommendations are usually in terms of tons per acre of limestone or the equivalent of other forms of lime.

Limestone is satisfactory if it meets these qualifications: 1—

90% or more neutralizing value (based on calcium carbonate); 2—Fine enough grinding so that (a) practically all passes a quarter-inch sieve; (b) 90% or more passes an 8-mesh sieve (8 openings per inch); (c) 25% or more passes a 100-mesh sieve.

Marl contains calcium carbonate, the principle form of lime in limestone. It is in most cases found in low-lying, poorly-drained areas and generally high in water content. For this reason it is most commonly applied on a cubic yard basis. Any marl containing 1000 pounds or more of calcium carbonate per cubic yard is considered high grade. It should be used at a rate of 2 cubic yards as equivalent to one ton of limestone.

Marl testing 80% calcium carbonate or higher, on a dry basis, will in most cases carry more than 1000 pounds per cubic yard as it is hauled to the farm. Frequently it will carry 1200 and more pounds per cubic yard. Sometimes marl testing "high" on a dry basis will have much less than 1000 pounds. On the other hand some "low" testing marl has more than 1000 pounds of calcium carbonate per cubic yard.

By-product lime from factories manufacturing beet sugar, paper, carbide, or from city water softening plants is entirely satisfactory for supplying lime to soils. These should be used on the basis of their test. Generally their value is similar to marl, and are used mostly on a cubic yard basis.

Hydrated lime is the form which is most active, quickly available. The same amount of lime value costs more, in most cases, than in other forms since 1200 to 1500 pounds are required to equal one ton of limestone.

Limestone meal, marl and refuse lime should be applied 6 months or more ahead of the alfalfa, clover or other legume seeding.

For seedings to be made next year—1950—apply the lime this spring. If this year's crop is to be corn, the lime can be applied either before or after plowing.

A good rule is, before breaking a sod, test the soil. If lime is needed, get it on. It is easy to spread lime on sod and there is no loss by plowing it under.

Potatoes in the crop rotation call for the use of less lime than the test indicates. If the soil is acid, limit the liming to 500 to 1000 pounds per acre of hydrated lime or pulverized limestone, applied after potato harvest. Greater amounts may result in increased scab on the tubers.

Mixed Hay Cuts Cost for Sheep

Condensed from the Dakota Farmer

Robert M. Jordan
South Dakota State College

A SHEEPMAN'S profits depend to a considerable extent upon how cheaply and how well he is able to winter his ewes. If the feeding expense is too great, he may find he has no profit at the end of the year regardless of his lamb crop. On the other hand, if his ewes are wintered cheaply but are thin, unthrifty, and poor milkers, his production is almost certain to be so low that profits cannot result. With high feed costs and moderately priced lambs, which appear to be somewhat permanent, economical wintering with high production is an essential for ranchers and farm flock owners.

Many people try to evade cost by "roughing" their sheep on cornstalks, dead weeds, and waste hay (hay of no commercial value and of little feed value). When lambing time approaches and they notice their ewes are thin and often shedding wool, they try to make up for their poor management by graining the ewes heavily. Up goes their feed cost and, while supplemental grain feeding before lambing will help prevent lambing paralysis to a large extent, there is usually not enough time to get the ewes in condition so they will milk well. In addition, the ewe has to be fed more liberally after lambing in order to maintain her milk.

It is apparent that, if this system is used, one will usually end up with a band of thin ewes, a poor wool crop, a big feed bill, and a lamb crop that is small and consequently unprofitable.

The following rations and comments on them will throw some light on the subject of why certain rations are better than others.

Group One Rations

1. Three to four pounds of legume hay.

2. Two and one-half to three and one-half pounds of legume hay and two to three pounds of silage.

3. Three and one-half pounds

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legume hay and one-fourth to one-half pound of grain.

Group Two Rations

1. Four pounds corn fodder or four pounds corn stover.
2. Four pounds grass hay and free choice oat straw.
3. Five pounds coarse woody hay of poor quality and one pound silage.

Group Three Rations

1. One pound alfalfa, two pounds prairie hay.
2. Three pounds brome, one-fourth pound soybean oil meal.

Four weeks before lambing one-half pound of grain may be added to each of the above rations. The rations listed in group one are all excellent rations. They are also quite expensive. Rations in group two are definitely inadequate. Little profit can be expected from sheep fed such a poor ration.

Rations in group three are of the nature that flock owners should try to follow. They provide the ewe with a well-balanced ration and ample nutrients to produce a good fleece and produce a good lamb as well as maintain the ewe's general health.

The South Dakota agricultural experiment station, during the winters of 1946–47 and 1947–48, conducted an experiment to determine the value of alfalfa, brome, and a mixture of the two hays for wintering bred ewes. The following paragraphs compare these three types of feeds and, in addition, plain brome hay when supplemented with soybean oil meal at two different levels.

Ewes, fed 3.8 pounds of alfalfa and .55 pounds of shelled corn daily, gained 20.3 pounds in a 100-day feeding trial. Their fleece weight was 7.6 pounds. Feed costs per ewe were $5.36. Their lambs weighed 64.4 pounds at 110 days. This group will be referred to as lot one.

Ewes, fed one pound of alfalfa, 2.8 pounds of brome, and .55 pounds of shelled corn daily, gained 13.3 pounds in the 100-day trial. Their fleece weight was 7.5 pounds and feed costs per ewe were $4.40. Their lambs weighed 64.6 pounds at 110 days. This group will be referred to as lot two.

Ewes, fed 3.8 pounds of brome and .55 pounds of shelled corn daily, gained 4.7 pounds during the 100 days. Fleece weights were 6.4 pounds and feed costs per ewe were $4.04. Their lambs weighed 61.3 pounds. This group is referred to as lot three.

Ewes, fed 3.5 pounds of brome, with .55 pounds of corn and .18 pounds of soybean oil meal daily, gained 12 pounds in the trials. Fleece weights were 6.7 pounds and feed costs per ewe were $4.66. Lamb weights were 56.1 at 110

days. This lot is referred to as lot four.

Ewes, fed 2.7 pounds of brome, with .55 pounds corn and .65 pounds of soybean oil meal daily, gained 26.5 pounds in the 100 days. Fleece weights were 7.2 pounds. Feed costs per ewe were $6.23. Lamb weights were 62.9 at 110 days. This lot is referred to as lot five.

All lots received bone meal and salt in their daily rations. These figures are for 1947–48, although similar results were obtained in 1946–47.

The ewes in lots one and five received almost twice as much protein as called for in Morrison's standards. Although the ewes gained more, they did not shear any heavier fleeces nor wean more pounds of lamb than the ewes in lot two. The ewes in lot two, which received about one-third alfalfa and two-thirds brome in their ration, not only produced equally as well as the ewes in lot one and five, but were wintered for about 20% less. Lot three is the cheapest ration but the ewes sheared light fleeces and the lambs weighed less—a good example of an inadequate ration.

This system of feeding about one-third alfalfa and two-thirds brome is superior to the feeding of prairie hay for a portion of the wintering period and then switching to straight alfalfa. A feeding of alfalfa in the morning and prairie hay at night will accomplish the same results. The abundant supply of protein in alfalfa balances the protein requirements of pregnant ewes when fed an alfalfa-prairie-hay ration.

When the ration is balanced, the feed is more palatable and less hay is refused. While excess protein which is found in a ration of pure alfalfa will not hurt a ewe, she cannot store it as protein and use it for tissue building later. Any excess protein in the ration is changed to a carbohydrate and used for energy or stored as fat, thus making it of no more value than a non-protein feed.

The above system of mixing legume hay and prairie hay will prove profitable and very practical and, unless ewes are in very thin condition, they will require a minimum of grain.

Push a Button . . . Hens Are Fed

Condensed from Successful Farming

Gerald Chapin

WITH the new type of endless-chain feeder, recently tested by Jim Starr of the Cornell Agricultural Engineering Department, you can feed your hens dry mash simply by pushing a button.

A job that used to take 9 days of work per 1,000 birds per year now can be done in a very few minutes and with very little effort. In addition, egg production is increased, because the feeder's stirring of the old mash and adding fresh arouses the birds' interest and coaxes them to eat more. Materials for building the original feeder cost only about $50.

The principle on which the feeder operates is quite simple. Small metal scrapers, welded to every fourth link of a 1″ flat-link chain, push mash from a storage bin at one end, out one side of a long hopper, and back the other.

Mounted on top of the bin, a ¼-hp electric motor, acting through a speed reducer, drives the chain at the rate of 30′ per minute. The speed reducer was made from a bomb hoist obtained from the War Assets Administration for $10.

To keep mash feeding down properly, a long drive shaft is extended from the speed reducer down through the center of the storage bin. To this, a loop of piano wire is attached to act as an agitator. When the bin is full, the wire wraps close to the shaft, thus agitating only the mash in the center. As the bin empties, the wire gradually springs out to scrape down the mash near the outside. This type of agitator considerably reduces the amount of power needed to drive the feeder.

To regulate the flow of the mash and prevent overloading the chain, a metal disc 10″ in diameter was fastened to the drive shaft just above the false bottom of the bin. Two holes, 180 degrees apart, were cut in the disc near the outer edge to match a similar hole in the bottom.

As the shaft turns, the holes coincide twice each revolution, so that the mash can drop through to the chain in the proper amount for even distribution.

The present feeder is an experimental model designed to feed only a small number of hens. However, there is no reason why it cannot be made longer, depending on the number of birds

Reprinted by permission from Successful Farming, Des Moines, Iowa, March, 1949

you want to feed. By using a longer hopper and chain, mash could be distributed the entire length of a laying house from a bin in the feed room.

Also, by the use of an electric timer, the feeder can be run automatically. A similar feeder, developed at Pennsylvania State College, was operated by two timers which ran it for two minutes every half hour. However, Starr cut the expense of the feeder about in half by eliminating the timers. He plans to operate the feeder for a few minutes each time he gathers the eggs.

In building an endless-chain feeder, the major items of expense are the motor, the speed reducer, and the chain. Once you have these, the hopper can be made longer without much extra expense, if you want to accommodate more birds.

If you have a large number of hens, the saving on labor alone will go a long way toward paying for the feeder. And, in addition, you save considerable time, and you get more eggs.

The Story of Copper

Condensed from the Fertilizer Review

SIXTY-SIX years ago, research men in France vigorously working to conquer diseases invading the valuable vineyards of their country, developed a product known all over the world today as Bordeaux mixture. This material is widely used as a fungicide on plants such as potatoes and tomatoes to help keep them free from disease. Its principal active component is copper sulfate and it is applied both in sprays and as dusts.

Only in recent years has the function of copper as an element necessary for plant and ahimal growth been recognized. Yet recognition of its importance in remedying deficiencies in the content of our soils has spread rapidly. In 1942, 30,000 tons of copper sulfate were used by American farmers, and nearly all of it was for fungicides. By 1944 the tonnage had jumped to 51,850 tons, of which only about 3,000 tons were applied as plant food. This upward swing in copper usage, particularly as a fertilizer, should continue as the native supply in our soils becomes exhausted through removal by plants, leaching and erosion.

The original work done with

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616 Investment Building, Washington, D. C., Sept.-Oct. 1948

copper to improve the soils content was on the peat soils of the Florida Everglades where it was discovered that Bordeaux mixture not only helped to control the devastation by insects and disease but also acted as a stimulant to truck crops. When copper sulfate was applied directly to the soil in amounts of 30 to 50 pounds per acre, superior crops and increased yields resulted.

Soils high in organic matter, particularly newly cultivated peat soils, are those most frequently discussed in connection with copper deficiency. However, such deficiencies are known to occur in soil of almost any type and they are more common in acid soils than in neutral soils.

Although the consumption of copper in fertilizer is low in total volume, any failure to provide this element where it is needed may lead to serious results. It is necessary for both plant and animal growth. Its most frequently suggested function in plant metabolism is in the formation of chlorophyll. In animal life, its presence is needed for hemoglobin formation and regeneration

The principal source of copper for agriculture is copper sulfate, which is also called bluestone and blue vitriol. Some attention is also being given to copper oxide as a possible source. Lack of copper in soils cannot always be detected by symptoms. There are varying degrees of deficiency, from those causing only slight decreases in yield to those allowing almost no growth at all. Symptoms vary greatly among plants of the same family and even among identical plants grown under different climatic conditions.

Evidence of the need of copper in many of our soils is firmly established. Large quantities are being used in the citrus-growing areas of Florida and California where it has been found that its applications will cure and prevent "dieback." Grossenbacher 1916 and Floyd 1917, both of Florida, reported that soil treatment with bluestone (copper sulfate) cured this disease.

The muck soils of Michigan, Indiana and Ohio all respond readily to copper sulfate applications. In New York, it was found that muck soils which produced onions with thin, poorly colored scales and with tops that died prematurely responded to applications of finely ground copper sulfate up to 300 pounds per acre.

Five years of research on Miami silt loam in Wisconsin showed that an application of copper increased sweet corn yields 25 percent on the average.

Scientists have discovered that copper applied as a fungicide usually provides adequate amounts for the fertilization of the soil since the element is taken up through the foliage of plants.

Aware of the need for copper in the soils of many areas, the fertilizer industry has added it to many of its products. A common fertilizer in Florida, for instance, is a 4-6-8-3-1-½ which in addition to the usual nitrogen, phosphoric acid and potash, includes magnesium oxide, manganese oxide and copper oxide in the order listed.

In the continental United States there are at least five plants manufacturing copper sulfate, and at least two plants manufacturing copper oxide, for agricultural use. These firms amply supplied our farmers with available copper through the hectic war years, in addition to producing the vital copper needed for defense materials by our armed forces and those of our allies. Industry's work in supplying copper for agricultural purposes is assuming increasing importance.

Kentucky 31 Fescue

Condensed from the Kentucky Farmer

William C. Johnstone
University of Kentucky

KENTUCKY is known as the Blue Grass State. It is also a great orchard grass state. Now comes a new grass, Kentucky 31 fescue, to share honors with these two great grasses, to add prestige to Kentucky's name, and to give greenness and protection to her hills and valleys and to feed her livestock.

Bluegrass and orchard grass have been limited in their area of adaptability. Throughout the mountains of Kentucky good pasture has been the exception rather than the rule. Now, Kentucky 31 fescue is being called the "Blue Grass of the Mountains."

The story of Kentucky 31 fescue dates back to 1886 when a young Menifee County farmer, William M. Suiter, like all young farmers when the first signs of spring appear, got the urge to plow and get out a corn crop. So he "geared up" his team and took his hillside plow far up on the mountainside to break a patch of bench land. As he worked around the hill, turning each furrow downward, his mules stopped to bite off bunches of tasty, green grass. As the team rested and feasted on the grass young Suiter explored the

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hillside to find the extent of the area where the grass grew. He found it centered around a wet place, fed by a small spring where migrating ducks and geese were known to stop for feed and water. Watching the mules eat the green grass when all other vegetation was dormant, Suiter had a vision of a green pasture on the steep mountainside behind his home where his team and cattle could graze throughout the year. So when he started his plow again he bore down on the handles and left the grassy spot undisturbed. That June when the seed ripened Suiter stripped them by hand and diligently sowed them in the fall. Each year he followed the same procedure until, nine years later, he had enough seed to sow the mountain pasture. Today, fifty-two years later, the pasture is still in sod. The grass has continuously produced pasture for the family livestock and protected the soil from the ravages of erosion.

William Suiter was a pioneer in soil conservation by Nature's method—grass. He sowed it and sold the seed to his neighbors and it became known locally as "Suiter's grass."

Late in the fall of 1931 a sorghum show was held at Frenchburg and Professor E. N. Fergus, agronomist at the University of Kentucky, was the judge. After the ribbons were awarded, an old man, the same William Suiter who had saved the wild grass from destruction 44 years before, brought a clump of the grass to Dr. Fergus for identification. On that day Dr. Fergus visited the Suiter farm and found it green from creek bottom to mountain top—quite a contrast to most of the brown fields he saw throughout the state at that time of the year.

Dr. Fergus recognized the grass as a variety of fescue and obtained seed from Suiter to include in test plots at the Experiment Station. He labeled the seed "Fescue 31" to indicate the year the testing began; hence the present name of the grass.

By 1940 tests conducted in various parts of the state showed the grass to be adapted to a wide variety of conditions. It was not until 1945, however, when demonstration plots in various parts of the state had proven successful, that interest in the grass became widespread. Since that year seed production has increased from 500 pounds to about 3 million pounds in 1948. During the past two years Kentucky farmers have shipped Kentucky 31 fescue seed to every state in the Union and to almost every country in the world. The 1948 seed crop sold for about 2 million dollars and over 300,000 acres are now growing in Kentucky.

Kentucky 31 fescue is a strain of tall fescue, known botanically

as "Fescue elatior, var. arundinaceae." How the first seed ever came to the mountains of Kentucky will always be, like the history of Kentucky bluegrass, a debatable question. Some think it was brought in by birds; others believe that the early pioneers brought the first seed or that it came in mixtures of other seeds from mail order houses.

Other areas of tall fescue have been found growing wild in eastern and southern Kentucky. The plot in Garrard and Lincoln Counties is on the route of the old "Wilderness Trail," along Stingy and Gilbert Creeks, in the vicinity of the first church organized West of the Allegheny Mountains. Tests are now being conducted by the Kentucky Experiment Station with fescue from these various sources to see if any show superiority over the others.

The merits of Kentucky 31 fescue are not confined to Kentucky. It is growing successfully as far south as Florida. In Georgia a Kentucky 31 Fescue Association has been organized to promote an increase in the acreage in that state. Throughout the South it is hailed as a blessing to restore a protective covering to their hillsides.

What are the particular merits of Kentucky 31 fescue that have aroused such widespread interest? Most important is its wide adaptability. It grows extremely well on cold, wet "crawfishy" land, where other grasses cannot survive. On the other hand, it establishes a good sod on dry, steep hillsides. It is easier to establish on the best soils of the Central Blue Grass Region. Its deep root system not only permits it to feed and get its water from greater depths than most other grasses but it develops a sod tough enough to support heavy livestock when the soil is wet. Its hardy growth permits it to suppress weed growth and it withstands a lot of shade.

Kentucky 31 fescue is primarily a pasture grass. In mixture with legumes it is suitable for hay or silage. It is excellent for roadsides and makes a good sod for airfields and athletic grounds.

Right Temperature Makes Corn Yield

Condensed from Eastern States Cooperator

Dr. George C. Scarseth,
Director of Research, American Farm Research Association

Corn is not the hot weather plant we have believed it to be. Yet on a hot night late in June it has been said, "You can actually hear it grow". The "corn days" of spring are indeed those rare hot days and nights after warm showers. These warm the soil so that preserved organic matter starts decaying because the soil bacteria awaken into action. In the soil this process releases nitrate nitrogen for the corn from the proteins of the organic matter. While the soil remained cold, too little of this occurred and the little corn seedlings looked yellowish and sickly.

So we agree that corn is largely a hot-weather-loving plant while making stalks and leaves, but from tasseling time to maturity corn does best with temperate days and cool nights—(What is true for corn is true for grains and other starch-producing plants.)

Here are some of the basic causes for this performance. First we must know that from silking date to ripeness the big job of the corn plant is to make the ear. The ear is largely starch. It contains about nine percent protein and some oil, but oil is closely related to starch, and for our purposes we'll dwell on the starch angle.

Starch is made up of carbon (C), hydrogen (H), and oxygen (O) in this ratio of $C_4H_{10}O_5$. Starch is a solid storage product in plants, and is formed from simple sugars ($C_6H_{12}O_6$) which are made in the leaves and are soluble so that they can be moved to the ear for storage. It is this storage product we harvest and sell.

The starch won't be deposited in the ear until the concentration of the sugar gets high enough. This concentration of sugar for starch deposition seems to vary in different plants. This means that if there should be any conditions that keep the sugars in the plant from building up into sufficient concentrations to be changed over to starches such conditions would greatly affect the yield.

Sugar is made from the common gas carbon-dioxide, CO_2 (the air contains about 0.03 per-

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Springfield, Mass., May, 1949

cent of it) and water, H_2O. The sun performs the wedding of these two common chemicals into a bond we know as sugar. The ring bearer is the green pigment called chlorophyll in the leaf where the wedding takes place. The wedding ceremony is known as photosynthesis. In higher language it is documented as:

$$\underset{\text{carbondioxide}}{OCO} + \underset{\text{water}}{HOH} \underset{\text{Respiration}}{\overset{\text{Photosynthesis}}{\rightleftharpoons}} \underset{\text{simple sugar}}{C_6H_{12}O_6}$$

If this were all there was to it we would see that a good-sized plant and a lot of sunshine would mean a lot of sugar; lots of sugar equals lots of starch and thus a big yield. However, there is more to it. There is a big process called life that needs energy to live through the dark nights and to do some other jobs in the plant. *This life process uses up sugar and releases carbondioxide and water* back to their natural forms. This life process is called *respiration.* To show it in the chemical equation, we draw an arrow pointing to the left and label it *respiration.*

Now it has been found that the rate of respiration, which is the same as saying, that of burning sugar, or the rate of the living process, speeds up with every increase in degree of temperature. Thus the hotter the weather the faster is the burning up of sugar. If the nights are extremely hot and long so much sugar may be burned up as to cause less to be forced over into the starch form, and the yields will be cut.

Figure out for yourself why potatoes do best along the cool northern states; why oat yields are best in cool seasons; why yields of grain are disappointing when a hot spell hits the ripening season; why corn yields are a bit off in too early varieties that ripen while the nights are still warm; why the corn yields in the southern states may never be as high as in the cooler regions, even with adequate fertility; why corn is flinty in the tropics; why bluegrass does best in the spring and fall; why apples are more red some seasons than others (there are also other factors); and a lot of other angles that may really have some practical value to you.

Chlordane for Control of Hog Mange

Condensed from Hog Breeder

SWINE mange is a common parasitic problem throughout the country, affecting swine of all ages. More than 95% of the swine herds in northeastern Nebraska are affected. Iowa officials advise that over 50% of the herds in Iowa are affected.

Specific data on losses from swine mange on the farm and in commercial feed lots is not available. However, the U. S. Department of Agriculture Year Book (1942) the latest available figures, estimates an average loss of $2.00 per animal in infested herds. At present high prices, the loss would be much higher. In winter and early spring, large numbers of mange-infested hogs are received at markets. They are sold at a discount. In advanced cases, the hams, shoulders and bellies must be skinned when slaughtered and sold for less. The total loss for the entire country is a staggering figure.

Mange is caused by small mites which burrow deeply into the skin, spending their entire life on the infected hog. It spreads chiefly by direct contact with infected animals and quarters. The mites multiply rapidly on untreated animals. A female mite lays 10 to 25 eggs in the folds of the skin. They hatch in four or five days. These newly-hatched parasites become sexually mature and begin laying eggs when 10 to 12 days old. Thus, the life cycle is completed in about 21 days. As the mites burrow into the skin, they produce intense irritation (itching) and inflammation. Vesicles develop, break and discharge serum that dries, producing a scaly, thick, wrinkled condition of the skin. The entire body may become involved in four to six weeks, severely stunting the growth of affected animals and decreasing their market value. The mites are very small and often hard to find. They are particularly active during cold weather when hogs are housed in close quarters.

The treatment of swine affected with sarcoptic mange has been until recent years, very unsatisfactory in results accomplished. The old dipping solution officially recommended required four to six dippings for a complete clean up. This was discouraging and most swine growers were reluctant to attempt carrying out such a prolonged program. Consequently, little progress has been made in

Reprinted by permission from the Hog Breeder,
Chicago, Ill., May, 1949

eradicating or even curtailing the disease.

During the past three years, the Omaha Live Stock Sanitary and Loss Prevention Board has been working with Nebraska livestock sanitary officials, entomologists and practicing veterinarians, testing some of the newer insecticides for their effectiveness in treating sarcoptic mange. More than 2,000 head of infected farm and feed lot hogs have been treated with chlordane and benzene hexachloride. Both of these have given excellent results in cleaning up even the most advanced cases with one treatment. However, considerable objection to benzene hexachloride has been encountered because of its persistent, undesirable odor and its tendency to taint the meat of hogs if slaughtered soon after treatment. A 0.25% unheated solution of chlordane has been found effective when used either as a dip or spray and does not taint the meat. One pint of a 45% emulsifiable concentrate to 25 gallons of water is required for making a 0.25% solution. Special veterinary emulsion concentrates only should be used. The type of concentrate normally used for crop application is not satisfactory to use on livestock.

On test lot hogs, a power sprayer was used, developing 50 to 250 pounds pressure, putting one to two quarts of the solution on each hog. Hogs in these tests were found relieved of irritation within a few hours after treatment and showed marked improvement in general condition at the end of one week. In two weeks, the heavy scabs were loose and scaling off. The skin underneath was pink and pliable and a new coat of hair was developing. The tests indicate that one application of a 0.25% chlordane solution, when thoroughly applied, will completely clean up sarcoptic mange.

For spraying, the hogs should be crowded into a small pen or hog house. If a foot of clean straw is used on the floor, it soon becomes saturated with the spraying solution and helps in wetting the legs and under side of the hogs. It is important to see that every hog is thoroughly wet, paying particular attention to the head and inside of the ears which are favorite resting places for sarcoptic mange mites. A 50 gallon barrel can be used for dipping pigs and shoats. Fill it 1/2 to 2/3 full with a solution of the same strength recommended above.

Mange is usually spread by direct contact with infested animals, but there is a possibility of hogs picking up live mites from infested premises which should be sprayed preferably with a 2% solution—one pint of 45% emulsion to 3 gallons of water at the same time the animals are treated. If prac-

tical, it is safer to put the freshly treated swine on clean ground. If this cannot be done, it should not prevent the treatment being carried out. Good results have been obtained in some cases where swine treated with chlordane have been put directly back in the same pens.

If, for any reason, one treatment fails to completely clean up the infection, the recommended treatment may safely be repeated.

In view of the high cost of current feed supplies, the man raising hogs today must follow better feeding and management methods than have been followed by many farmers in recent years if he is to produce pork at a profit. Clean, thrifty, fast-growing shoats turn feed into pork more economically than do shoats that are infested with mange and they are also in better condition to resist other diseases.

Care of the Milking Machine

Condensed from the American Agriculturist

Paul R. Hoff

The milking machine is expected to operate two and perhaps three times each day, 365 days each year. To deliver this uninterrupted service, it must be in good mechanical condition, and to avoid being a source of high bacterial count in the milk, it must be kept scrupulously clean. The parts which come in contact with the milk must be cleaned after each milking, and stanchion hoses, pipe lines and other parts at intervals as specified in the instruction book.

One manufacturer states that partially clogged air passages stop more milkers than all other causes put together and next to that comes leaks. Most of the troubles that come from these causes can be avoided if the user follows the instruction book. It is also important to have brushes for the specific make of machine. Brushes are easier on rubber parts than are metal cleaning tools.

Cleaning the units can be easier and much more thorough if there is a stall cock in the milkhouse. Using a stall cock, the procedure for cleaning the units is as follows:

1. Rinse the milker immediately after using it in lukewarm

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or cold water. Pull from 2 to 3 gallons of warm water through each unit, dousing the teat cups up and down, in and out of the water. This removes most of the milk left in the machine. It is also good practice to rock the pail to splash water all over the interior. This must be done after the stall cock is turned off and while vacuum is still in the pail. Using the rinse water, brush the inside of the pail, the pail lid, petcock and then the outside of the pail. Use a separate rinse water for each unit.

2. Pull through the milker 1½ to 2 gallons of 130° to 140° water to which has been added a heaping tablespoon of a good dairy washing powder. Use clean water for each unit, as the water must remove all of the milk and butter fat from the machine. Wash all dried milk and other dirt from the outside of the tubes and the teat cups.

3. Sterilizing is not effective unless all old milk and dirt have been washed from the milking machine parts. Sterilizing of metal parts can be done with water at 180° temperature or with a chlorine solution of 200 parts per million (instructions for mixing are found on the packages of commercial chlorine products). A ½ per cent lye solution can be used to sterilize rubber parts. Do not use the lye solution to sterilize metal parts.

With the machine assembled, draw 6 to 8 quarts of the chlorine solution or 180° water through the teat cup assembly and into the pail. Hang the teat cup assembly on a solution rack and fill with ½ per cent lye solution. The pail can be inverted on a rack and the lid hung so that it will dry and remain clean. Just before the next milking, rinse the lye solution from the teat-cup assembly by drawing 3 gallons of water through the unit.

Many times the vacuum pump is blamed for its inability to move enough air fast enough when a partly clogged pipe line is the real cause of low vacuum. Among the common causes of pipe line clogging are:

1. A leaking pail that may cause the current of air to draw milk into the pipe line.

2. A leaky inflation that allows milk to be drawn into the pipe line.

3. Removing the milker from the cow before disconnecting the long vacuum hose from the stall cock can cause milk to be drawn into the pipe line because milk in the pail may splash through the check valve.

4. In cold barns, ice may form in the pipe line.

5. Overturned milk pails.

It is good practice to flush out the vacuum line at least twice a year, and some manufacturers recommend that the line be cleaned more often. To clean the

vacuum line, draw a 3 to 4 per cent hot lye solution through from the stall cocks to the moisture trap, beginning with the stall cock nearest the pump. Draw about a quart of solution through the first stall cock then skip 1 or 2 stall cocks and draw another quart of solution through the next stall cock on the line. Continue until the stall cock farthest from the pump has been cleaned. If the lye solution is drawn through the stanchion hoses in the process of flushing out the vacuum line, the hoses will be cleaned at the same time. Do not draw more solution through the line than the moisture trap can hold, because it will overflow into the pump and damage the valves.

It is economical to use 2 sets of teat cup liners for each machine, changing them weekly. Manufacturers state that 2 inflations handled this way are likely to last as long as 3 sets when each set is used constantly until it is worn out. When the set is taken out of use for the week, it should be thoroughly cleaned by being boiled in a ½ per cent lye solution for 5 minutes, because clean rubber lasts longer than does dirty rubber. Do not try to milk with liners that have been used so long that they have become large and have no life. New liners are not expensive and they will milk faster and cleaner.

The manufacturer's recommendations for the care of the pump and the pulsator should be followed. If the instruction book has been lost, the dealer can furnish another. One item of importance in the instruction book is the amount and time of lubrication of both the pump and the pulsator. Always use the lubricants recommended by the manufacturer, and if the pump has a splash lubrication system keep the oil at the correct level. Pumps located in cool places may collect water in the oil from condensation. This water mixes with the oil and reduces its lubricating qualities. In cool weather loosen the drain plug in the base of the pump to drain off any water that may have gathered there. At infrequent intervals the base of the pump may need to be removed to take out the sludge that has accumulated. When this is done, the base should be replaced with a new gasket and with fresh oil.

The Need for Feeder Type

Condensed from the Shorthorn World

Paul J. Hackett

I SPEAK from the commercial feeders point of view since that has been my major field of endeavor for the past twenty-five years. During that period I have been engaged in large-scale farming activities which entailed the production and fattening of many thousands of cattle, hogs and sheep.

Recently I received from one of the major packing companies a copy of an ad which appeared in the various country newspapers and farm journals throughout the country in October, 1948. I was attracted particularly by the title, Let's Weigh the Evidence. After reading this article and studying the facts presented I was convinced more than ever that my observations made during my past twenty-five years of livestock production and feeding have merit. This article contained these condensed research results: Purdue University weighed 7,554 pigs from 784 litters. Pigs that weighed two pounds at birth weighed only twenty-one pounds at weaning. Of the heavy pigs 77 percent lived to weaning age while only 49 percent of the light pigs survived to weaning age. The heavier pigs made a higher rate of gain in preparation for market.

The United States Department of Agriculture has kept a fourteen-year record on beef calves. Birth weights varied from 40 to 109 pounds. The heavier than average calves reached 500-pound weaning weight and a 900-pound marketing weight faster than the lighter than average calves.

The Sheep Experiment Station at DuBois, Idaho, find that they can use the scales to select breeding stock for greater production in the future. Their ewe lambs that were heavier than average at weaning time proved to be the best producers both in total lamb and fleece weight.

In the case of our own hog production, which at times reached a peak of 10,000 pigs produced annually, my observations were identical with the results obtained at Purdue. Both straight breeding and cross breeding of hogs were employed and I found the cross-bred pigs were heavier at birth and weaning time and were the

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Des Moines, Iowa, January 10, 1949

first hogs to go to market.

The results of our lamb production program this year exceeded our fondest expectations. The ewe flock consists of 1,000 large white-faced western ewes. The wool output of this type ewe averages 10 and 11 pounds annually which goes a long way towards paying the feed bill incurred during the winter season. These ewes are bred to purebred Southdown rams which produces a compact, high quality lamb yielding a high dressing, meaty carcass desired by both packer and consumer. In addition the number of lambs saved per ewe since using Southdown rams has been increased by about 25 percent. However, the important thing is this. Eighty percent of the lambs produced this year went to market, and I might add, topped the market during the latter part of June and early July.

With due respect for the tremendous strides made by the purebred breeders over the years in the betterment of all beef cattle up to this point, the question as I see it is, "Has the beef cattle breeder gone too far in his efforts to produce a small bodied, compact, fine-boned animal, thereby sacrificing that all important requisite to the cattle feeder, namely, the animal's ability to produce a substantial economical daily gain." It is my opinion that this condition has gradually come about and is very much in evidence today.

For the past several years I have been very much concerned about the daily gain we have been able to get on our cattle in the feed lot. It is now the exception rather than the rule to average two pounds per head per day. A few years ago I was able to average consistently at least two and one-half pounds daily on yearlings and from two to two and one-third pounds daily on calves. During all these years I have tried to buy cattle of choice quality with all cattle raising sections of the country represented. Therefore, our reduction in daily gain has not been because we have gone to lower grade or poorer quality cattle or because our purchases have been confined to one section. In the feeding of between four and five thousand head annually this reduction in daily gain has incurred a substantial increase in the cost of our beef production and is giving us a great deal of concern.

I have considered this reduction in daily gain from the standpoint of feed and especially from the angle of hybrid corn. Experiment stations over the country have conducted tests on the feeding of hybrid corn and their results definitely eliminate this consideration. Our system of feeding and kind of

feed has varied little over the years.

Therefore, I have come to the conclusion that something definite has happened to the type of cattle which we are able to purchase today. They are not rugged, deep-bodied, good headed cattle of a few years ago. Among the cattle that you feed today is a percentage that are outstanding gainers but also there is altogether too large an end which is just the opposite. They are the ones which pull down your gain and raise your cost. They can be well marked and apparently well bred, but they are tight hided, small of bone and body, and therefore, lack the capacity to consume enough grain and particularly roughage to make a good gain. In attending shows and sales of purebred cattle I always attempt to place the individuals before the judge makes his final decision. I judge the cattle more from the feed lot viewpoint and invariably the ones I select are moved down the line rather than towards the top.

We, who are engaged in the production and feeding of livestock, face a tremendous responsibility, a responsibility not only for our own welfare but the welfare of America. I feel a large measure of this responsibility must be borne by the purebred producer. Any improvement to come necessarily must originate to a large degree with the purebred livestock producer because he must furnish the seed stock for the entire livestock industry.

We cannot continue to produce grain on our present scale and continue to find a profitable market for this kind of farming. Therefore, land that is now devoted to grain production must be seeded to grass and on the grass must be livestock. When livestock prices again seek a level which you and I believe to be normal we must have the right kind of livestock, the kind that will yield a reasonable return at substantially lower selling prices than we have today and at a much thinner spread of margin between cost and selling price.

In cattle I consider the right kind to be early maturing, rapid gaining animals that can be sent to market as well finished individuals at lighter weights, say around 900 pounds. This can be accomplished if the individual has those characteristics which we always have desired but which are present only in a small percentage of our feeder cattle today. I would say to the purebred cattle breeder to give us a rugged, good-headed, deep bodied calf that has the capacity to utilize grass and roughage and we, as feeders, will do the rest, and with confidence as to the outcome.

The right kind of hog would be one that can be finished out at 200 pounds or less. Let's produce more lean pork per hog and less lard. Since the conclusion of World War I lard has been a depressing factor in the hog market most of the time so why continue to produce it in such large quantities. Lean pork is what the people want.

I would consider the right kind of lamb to be one that would be ready for market anytime within a range of 75 to 90 pounds. The majority of families are too small today to want a leg of lamb from a heavy carcass, and as a result such are difficult to sell. When meat once again becomes plentiful, heavy lambs will be a burden as in the past.

I would like to say again that I have nothing but the deepest respect and admiration for the tremendous advancement made in the improvement of all species of livestock by the purebred breeders up to now. But trends come and go and after a point is reached in the development of a particular type certain weaknesses appear. I believe the time has come when the efforts of the purebred industry should be devoted to giving us a type animal along the lines that I have been talking to you about. That is, give us an animal that is choice in quality which will yield more of the desirable cuts of meat, and at the same time utilize all feeds and roughage more efficiently, thereby making possible a more rapid daily gain at a lower cost, and a lighter finishing weight at an earlier stage of maturity. I trust the purebred producer realizes that the ultimate destination of all livestock is the slaughter house by way of the feed lot and range and not by way of the showring

Strength of Electric Wires

Condensed from Electricity on the Farm

J. B. Stere

Most of us have used wire to repair a piece of equipment. From this experience we learned that the strength of wire varies with its size and kind. A small wire is not as strong as a large wire. Wire that is hard to bend is stronger than soft wire. Several strands of small wire can be used to substitute for one large solid wire and the stranded wire is more flexible.

These same principles of mechanical strength are true for electric wires. Yet it is a common mistake to completely overlook mechanical strength when selecting size of electric wires to be strung overhead to the different farm buildings.

In selecting size of electric wires select one large enough to safely carry the electricity needed for good equipment performance and also large enough to avoid costly wasting of electricity. After the requirements of the electric load are satisfied then determine whether the wire is strong enough to carry its own weight and the weight of ice, snow, storm and birds. The accompanying chart provides an easy means for checking maximum length of span for different sizes of weather-proof wires. The longer the span, the

WIRE SIZE FOR DIFFERENT SPAN LENGTH

Based on a loading of ½" ice and 8 lbs. per sq. ft. wind pressure

Wire size A.W.G.	Breaking load of wire hard drawn	annealed	Maximum length of span for annealed wire
#14	213 lbs.	124 lbs.	not suitable for outdoor use
#12	337 lbs.	197 lbs.	
#10	529 lbs.	314 lbs.	50 ft.
# 8	826 lbs.	480 lbs.	125 ft.
# 6	1280 lbs.	762 lbs.	165 ft.
# 4	1970 lbs.	1210 lbs.	175 ft.
# 2	3000 lbs.	1930 lbs.	200 ft.
# 0	4520 lbs.	2980 lbs.	*200 ft.

* Strength of end supports, usually used on farms, limit span length to 200 ft. Sag for spans shown above can be about 3 ft. when end supports are strong.

The maximum spans shown above are for weather proof insulated annealed wire. This wire is most commonly available and easiest to work. Hard drawn wire is springy and difficult to stretch straight. Because hard drawn wire is seldom used, its span lengths are not shown. Also the strength of wire holders and the end supports usually found on farm buildings limit the length of span.

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New York City, February, 1949

greater the load, and the larger the wire needed.

An overhead wiring installation is no stronger that its weakest point. There are four points to consider in making a strong, safe installation—one that will stand up during storms and times when electricity is vitally needed. The four points are: (1) size of wire for length of span, (2) strength of bracket or wire holders and security of their mounting, (3) strength of end supports such as poles or building and (4) are wires protected from snow slides, icicles and trees? Each of these four points is illustrated in the accompanying chart.

Experiments with Nut Trees

Condensed from the Pennsylvania Farmer

IF THE nut growers of Pennsylvania accomplish what they have set out to do, Pennsylvania's consumers may some day buy chestnuts that are grown on native hills. Before the blight struck down our native chestnut tree, its fruit could be bought almost anywhere in the state, but at present the only chestnuts sold on farmers' markets come from west of the Mississippi or from Italy. Even though they lack the quality of our old native nut, Italian chestnuts recently sold on a York farmer's market at 32¢ a pound.

The most promising substitute for our native chestnut is the Chinese chestnut. It is as good or better than our old chestnut for eating purposes, and it is fairly immune to the blight. Not too much is yet known about its timber producing possibilities.

The Pennsylvania Nut Growers Association, which numbers more than 175 members, is not only interested in the production of nuts for human consumption. It wants the public to know the value of nut trees for wild life and timber. It wants the farmer to see the possibilities in nut trees as a valuable part of a farming operation.

One member in Franklin county, Fayette Etter, has done more than twenty years of experimental work with nut trees during his spare time. It all started when he was a boy on his father's farm. As he hunted and fished he came across the chestnut, hickory and other native nut trees. He

Reprinted by permission from the Pennsylvania Farmer, Pittsburgh, Penna., February 12, 1949

gathered their fruit in the autumn as any country boy would, but he did more than that. He noticed that many nuts supposedly of the same variety did not have uniform size or shape. This puzzled him to the point of active curiosity. When he started to work as a lineman for a local electric company, his intense interest in nut trees and their fruit did not leave him.

Instead, the curiosity grew into a hobby back in the middle twenties. He started off by grafting Persian (English) walnut scions on black walnut stock. In 1940 he expanded his experimental work by purchasing an eleven-acre plot of land and a house that were a part of his father's farm. That plot is now pretty well filled up with more than 2,900 trees, that are the outgrowth of numerous breeding experiments. Among them are: shagbarks, shellbarks, black walnuts, Persian (English) walnuts, filberts, Chinese and Japanese chestnuts, heartnuts, pig nuts, bitternuts, mocker nuts, pecans, chinquapins, persimmons, and so forth. More than 200 varieties, crosses and hybrids are included in the orchard.

Although Mr. Etter does not have a college or university degree in agriculture, he has done outstanding experimental work that is recognized by specialists in nut growing. For example, the United States Department of Agriculture has honored him by naming a variety of Persian walnut the Etter walnut. It is of medium size, the kernel is light in color and has a sweet taste. The tree is self-pollinating and starts to bear at an early age.

In his work with chesnuts he has discovered that the Chinese chestnut is superior to the Japanese trees, so he expects to concentrate on the Chinese varieties in the future. Current plans call for the following crosses: native chestnut with Chinese chestnut, Chinese chestnut with Rush chinquapin, and the native chestnut with chinquapin.

When he started his work with chestnuts one of the first things he did was to bring chestnut blight down from the nearby mountains. He got it down by transplanting native trees from their blight-ridden environment. Thus he was sure that his crosses and hybrids would have to contend with the disease and overcome it.

The Abundance variety of Chinese chestnut is one that has withstood the test. For instance one tree of the variety was planted in 1939 and cleft grafted in the spring of 1940. It started to bear in 1941 and has produced about 75 pounds of nuts. In 1948 it yielded a crop of 25 pounds.

Mr. Etter has found that the Abundance variety yields more regularly each year than do some

of the other varieties that he has tested. The nuts fall to the ground free of the burrs and have an even color. Like the other Chinese chestnut varieties, it yields a nut that tastes so good that it compares favorably with the taste of the native chestnut. It is not bitter like Japanese varieties. Mr. Etter pointed out that the native chestnut tastes best right after it drops from the tree. The Chinese chestnut is at its best several weeks after that.

Mr. Etter is doing some work to adapt the chestnut tree to adverse soil conditions. Ordinarily the chestnut tree favors well drained soil, but the pin oak and the scrub are able to get along in wet and marshy places. So he has tried grafts of Chinese chestnut on pin oak and scrub oak stock. This work resulted in a lot of failures, because the grafts would not grow properly. However, he completed the first successful graft eight years ago. He wrapped a shield tightly around the graft and left it on the first year or so. This prevented the faster growing pin oak stock from forcing the slower growing chestnut scion, out of position. The shield helped to keep the graft in place until it had knitted firmly to the stock.

Mr. Etter's experiments rank with some of the best in the country. They are an outstanding contribution to the nut growing industry.

Protein Supplements Don't Cost a Penny

There's no question about it; protein supplements cost a lot. So what about feeding small grains (wheat or barley) without the supplements?

You can, say Montana Experiment Station researchers; but it will cost you even more.

They figure it this way: their tests show that spring pigs on alfalfa pasture eat about 423 pounds of wheat to put on a hundred pounds gain. When the pigs get tankage too, they put on the hundred pounds with only 376 pounds of wheat and 7.7 pounds of tankage. That way, the 7.7 pounds of tankage saves 47 pounds of wheat. (And 47 pounds of wheat will buy several times 7.7 pounds of tankage.)

Furthermore, the pigs that get tankage go to market earlier and cash in on higher prices. So not feeding protein supplement is like not driving to town to pick up some free money, because it's going to cost you for the gas to get there.

—Farm Journal

Weather—and What is Done About It

Condensed from the Kansas Farmer

A. D. Robb
Meteorologist

It is reported a sage once said that men did nothing but talk about the weather. Perhaps in time past that was true. But of late certainly much has been done about the weather, and more is in prospect.

Most of these efforts have been directed toward mitigation of the effects of extreme weather conditions. Drouths have provoked or inspired farmers to build ponds and dams for irrigation. Drouths and heavy rains have both been incentives for terracing farms, one requiring the retention of moisture in the soil and the other the elimination of excess rain with as little soil erosion as possible.

Plants are bred to withstand adverse weather conditions or to make better than ordinary use of suitable climates. The industrial and commercial activities relative to either the utilization or mitigation of the effects of extreme weather conditions add up to a very great demonstration that men are doing more than talking about the weather.

With about 60 years of statewide records available in Kansas, many commercial and agricultural practices are governed by known weather conditions, generally limited to averages and extremes, which are readily available. Such means and extremes have been widely used, but they tell only a small part of the story. Frequency studies are necessary for the proper determination of many of today's industrial or agricultural projects.

Engineers find it valuable to know how often heavy rains of 5 inches or more fall within 24 hours for their guidance in construction of farm ponds, culverts and ditches. Definite information about the possible length of wet spells or the maximum number of days without rain, the number of consecutive days with afternoon temperatures above 100 degrees, or mornings, below freezing, or below zero is greatly needed by designers and businesses for the more efficient operation of their enterprises. The manual labor necessary to compile such statistics is enormous and oftentimes the end does not justify the expense. But as Dr. Isaiah Bowman, a former president of the American As-

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sociation for the Advancement of Science, has said, "Facts more valuable than all the gold of the Klondike lie buried in the Weather Bureau's climatological records." These "frozen assets" should be discovered and made available to those who have need for them.

To remove the drudgery and prohibitive cost from such statistical determinations, the Weather Bureau has procured a number of punched card machines and set up centers for processing the climatological observations made at more than 5,000 co-operative stations over the United States. This processing may be described as follows: The daily maximum and minimum temperatures, precipation, and snowfall are recorded on prescribed forms by the observers and at the close of the month the record is furnished the machine-processing center, where the data are recorded by means of holes punched in appropriate spaces on cards, which are especially prepared for use on the various machines. After the cards are punched, they can be run thru the "sorter," "tabulator," or "collator" at a very rapid rate for whatever determinations are desired, and finally the data are automatically typewritten for the user. It was thru the use of these machines that the military authorities provided their needed climatology during the war.

It is realized that this change from handcraft methods to mass production has certain disadvantages but, as in industry, assembly-line production has made many items possible that would have been far beyond reach of most of us if only hand work were employed. By the introduction of these punched card machines the Weather Bureau has modernized its climatological service and more time will be available to officials for research and interpretation of data and for presenting the facts to the public.

The Weather Records Processing Center for this area is at Kansas City, Mo., and serves the states of Wyoming, Colorado, South Dakota, Nebraska, Iowa, Missouri and Kansas. The first records to be processed from Kansas stations were those for August, 1948.

No longer is weather merely a conversational topic. It is becoming a very usable item as the facts about weather become known. Agriculture, business, and industry can profit by the "gold" buried in the records.

Crushing Hay Cuts Curing Time

Crushing alfalfa hay has cut in half the wait between mowing and drying or baling at Wisconsin Experiment Station. It caused a similar saving in curing time at the Cornell University dairy farm in New York.

Better-quality hay also results. More leaves are saved. Crushing permits more-even curing. Leaves don't shatter so much by the time stems are dry enough for baling or stacking. That's important because leaves contain 70 per cent of the protein and minerals and 90 per cent of the carotene in the plant, and are 40 per cent more digestible than stems.

Crushed Sudan grass hay was dry enough for baling in 27 hours at the Mississippi Experiment Station while regular mower cutting required 72 hours. At baling time carotene content of crushed hay was 35 per cent higher than uncrushed. Crushed hay still carried 35 per cent more carotene after 2 months' storage.

With its crusher mower, the dairy department of Pennsylvania State College has cut clover hay in the morning and put it in the mow within 8 to 10 hours in weather that would have required 30 hours for drying a regular mower-cut crop.

A disadvantage of crushed hay is that when it gets wet in the field it is damaged more than hay cut in the usual manner. On the unfavorable side also is the high cost of the rig.

The hay crusher is pulled by a tractor and driven by a power takeoff. It consists of a cutter bar followed by a pickup that delivers hay thru steel rollers. Rollers split stems which allows moisture to escape faster.

Crushing seems to hasten curing more in coarse-stemmed hay than in fine-stemmed crops. Heifers at Cornell dairy farm seemed to prefer baled crushed hay but cows liked that cut and cured in the regular way as well.

—*Capper's Farmer*

INDEX

BEEF CATTLE

Unreckoned Profits from Feedlot ... Nov., 1948
Blueprint for Beginners ... Nov., 1948
The Quest for Tenderness in Beef ... Dec., 1948
The Common Liver Fluke ... Dec., 1948
More Beef from Grass and Hay ... Jan., 1949
Shipping Fever ... Feb., 1949
Steer Feeding Experiment ... Feb., 1949
Bright Future for Beef Breeding ... Feb., 1949
Destroy Those Grubs ... Mar., 1949
The Beef Steer ... Mar., 1949
Factors in Fattening Steers ... May, 1949
Breeding Efficiency ... June, 1949
Cattle Breeding in India ... June, 1949

CONSERVATION

America's New Acres ... Nov., 1948
Why be a Friend of the Land? ... Jan., 1949
Vermont's Sandblows ... Jan., 1949
*Is Soil Conservation Worthwhile? ... Feb., 1949
A Living Rose Fence ... Feb., 1949
New Things on Agricultural Lands ... Mar., 1949
Seeding from the Sky ... May, 1949
Strip Cropping Made Easy ... May, 1949
Protect the Birds ... June, 1949
Farm Game Program in Maryland ... June, 1949
Who Cares about Tomorrow? ... June, 1949

CROPS

*Get Corn Rootworms Chemically ... Oct., 1948
*Weedless First Cutting of Alfalfa ... Oct., 1948
*Turn Atomic Energy on Corn ... Oct., 1948
Birdsfoot Trefoil ... Dec., 1948
Kentucky's Wonder Grass ... Dec., 1948
You could have more Corn ... Dec., 1948
Sudan Grass ... Dec., 1948
*Are Soys hard on Soil? ... Dec., 1948
*New Royal Wheat ... Jan., 1949
Seed Certification ... Jan., 1949
Hard Seeds in Legumes ... Jan., 1949
Conditions Affecting Crops ... Feb., 1949
*Stubble Mulch ... Feb., 1949
*Wheat ... Feb., 1949
Right Rotation for Your Farm ... Mar., 1949
Nitrogen for High-Protein Corn ... Mar., 1949
Management of Grasslands ... May, 1949
*A 10-Second Moisture Test ... May, 1949
Super Seeds in Magic Overcoat ... June, 1949
Irrigation is Profitable ... June, 1949

DAIRY CATTLE

Breeding High Testing Cows ... Nov., 1948
Factors Affecting Fertility ... Nov., 1948
Aspects of Milk Hygiene ... Nov., 1948
Milk Production in Pen Barns ... Dec., 1948
Trace, Minerals Nutrition ... Dec., 1948
Buying a Dairy Cow? ... Dec., 1948
Why Do Cows Bloat? ... Jan., 1949
Keeping Old Bulls in Service ... Jan., 1949
Cooperative Milking Barns ... Jan., 1949
*Calves Like Old-Fashioned Straw ... Mar., 1949
*What Is This Dairy Bull Worth? ... Mar., 1949
Proved Sires—What are they? ... Apr., 1949
Fertilizer licks Breeding Troubles ... Apr., 1949
*Cobalt ... Apr., 1949
More Grain for Your Dairy Cows ... May, 1949
Building and Preserving Udders ... May, 1949
Dairymen's Crossroads School ... June, 1949
Cows and Legumes do the Work ... June, 1949

FARM ECONOMICS

On the Spot Farm Research ... Feb., 1949
Planning Committees ... Feb., 1949
Philosophy of Balanced Farming ... Mar., 1949
Farming with a Plan ... Apr., 1949
Up-to-date Farm Insurance ... Apr., 1949
How Big is Your Farm? ... Apr., 1949
British Farmers' 3-yr Plan ... Apr., 1949
Specialized Farming ... May, 1949
Good Farm Management ... June, 1949

FARM BUILDINGS

A Fence for the Future ... Feb., 1949
Dairy Pen Barns? ... Feb., 1949
Fence Post Magic ... Apr., 1949
*Less Cleanup at Blower ... Apr., 1949
How to Cool a House ... May, 1949
How Handy Can a Farmstead Be? ... May, 1949
Developments in Dairy Stabling ... June, 1949
Fire on the Farm ... June, 1949

FARM EQUIPMENT AND MACHINERY

Field Forage Harvester ... Mar., 1948
Milking Through a Pipe ... Apr., 1948
Farm Mechanization ... Dec., 1948
*Cleans Barn every 7 minutes ... Dec., 1948
Electric Litter Stirrer ... Feb., 1949
A new way to buy Machinery ... Apr., 1949
*Revive Your Rusty Tools ... May, 1949
Protect Your Electric Motor ... May, 1949
Barn Cleaners Minimize Drudgery ... May, 1949
Reduce Silage Losses ... May, 1949
Hay-Driers Make Top Quality Hay ... May, 1949
Buying too much Machinery? ... June, 1949
Aluminum for Farm Buildings ... June, 1949

FEEDS

Feed those Cobs ... Dec., 1948
Grow Your Own Feed ... Mar., 1949
Help in Selecting Feeds ... Mar., 1949
Stock Feed from Wood ... Apr., 1949
News that may cut Feeding Costs ... Apr., 1949
"Hidden Starvation" in Livestock ... May, 1949
Making Grass Silage ... June, 1949

FERTILIZERS

The Story of Nitrogen Fertilizer ... Oct., 1948
Nitrogen helps Winter Wheat ... Dec., 1948
*Noncaking Fertilizer ... Jan., 1949
Buy Lime by Quality ... Jan., 1949
Are You Wasting Fertilizer? ... Feb., 1949
Phosphates from Ancient Animals ... Feb., 1949
Slags Have Liming Value ... Mar., 1949
Hardening Plants with Potash ... Mar., 1949
*Sick Soil May Need Boron ... Mar., 1949
Compost Development in India ... Apr., 1949
Rock Phosphate ... Apr., 1949
Chemicals Recharge Desert Soils ... May, 1949
Let's Use Fertilizers Wisely ... May, 1949
Methods of Applying Fertilizers ... May, 1949

FORESTRY

How to Heat with Wood ... June, 1948
Fence Posts from Soft Woods ... June, 1948
Sweet Gum from the Sweetgum ... July, 1948
What about Windbreaks ... Oct., 1948
Spray Stumps at any Time ... Dec., 1948

INDEX

Woodland Co-op ..... Feb., 1949
Shade Trees for the Farm Home ..... Mar., 1949

FRUIT

Hormone Sprays ..... Dec., 1948
Orchard Mulch ..... Mar., 1949
*Mulching Saves Orchard Soils ..... Mar., 1949
Planting Good Nursery Stock ..... Apr., 1949
*Wax Boosts Fruit Size ..... May, 1949
Storing Orchard Chemicals ..... May, 1949

HAY

*Legume Hay Licks Cobalt Trouble ..... May, 1949
Hay-Driers Make Top Quality Hay ..... May, 1949
Drying Baled Hay with Heat ..... June, 1949

HOGS

Proteins for the Growing Pig ..... Feb., 1949
Care of Unborn Litters is Vital ..... Feb., 1949
*Hog Production Records ..... Feb., 1949
Production Testing Pays ..... Mar., 1949
More Pork an Acre ..... Mar., 1949
*Hog Profits in Rye and Alfalfa ..... Mar., 1949
*Copper Speeds Pig Gains ..... Mar., 1949
Swine Sanitation ..... Apr., 1949
*Stores Sod to Feed Pigs ..... Apr., 1949
*Pack Vitamins in Pigs for Winter ..... May, 1949
Hogs a Bigger Market for Forage ..... May, 1949
Test Your Own Sows ..... May, 1949
It Pays to Pasture Pigs ..... June, 1949
Sow Output sets Hog Profits ..... June, 1949
A Good Start is Vital ..... June, 1949
*Legumes and Big Pig Litters ..... June, 1949

HORSES

New Killers for Livestock Pests ..... July, 1948
The Agriculture Remount Service ..... Oct., 1948

INSECTS & INSECTICIDES

Control of Cattle Parasites ..... Oct., 1948
New Test for Weevils ..... Nov., 1948
Parathion for Greenhouse Pests ..... Nov., 1948
Ohio's First Fly-Free County ..... Dec., 1948
Fly Resistance to DDT ..... Jan., 1949
Where Do New Insecticides Lead? ..... Jan., 1949
Destroy Those Grubs ..... Mar., 1949
Bees on every Farm ..... Apr., 1949

PASTURES

Pasture Renovation Pays ..... Dec., 1948
Path to Profit is Grass Covered ..... Jan., 1949
Profitable Pastures ..... Mar., 1949
*Pitting Makes More Grass ..... Mar., 1949
Pasture Champion of New England ..... Apr., 1949
Green Pastures all Season ..... Apr., 1949
Permanent Pastures in S C. ..... May, 1949

POULTRY

Estrogen Fattens Turkeys Faster ..... Nov., 1948
Feeding Methods for Pullets ..... Nov., 1948
Baffle Boards Keep Litter Dry ..... Dec., 1948
*Crosses find their Niche ..... Dec., 1948
Breeder Selection ..... Jan., 1949
Why Deep Houses Are Better ..... Jan., 1949
Methods of Packaging Poultry ..... Jan., 1949
More Eggs in Top Grade ..... Jan., 1949
Chick Mortality ..... Feb., 1949
Steaks Sell Turkeys ..... Feb., 1949
So That Fewer Chickens Die ..... Feb., 1949
Electric Litter Stirrer ..... Feb., 1949
Broiler Profits ..... Mar., 1949
What's New in Poultry Nutrition ..... Mar., 1949
It's Cut-up Chicken 20 to 1 ..... Apr., 1949
Advantages of Poultry Pastures ..... Apr., 1949
Feeding Grain Free-Choice ..... Apr., 1949
Streamlining Poultry Breeding ..... May, 1949
Geese are Profitable ..... May, 1949
Selling Whole Cooked Chickens ..... June, 1949
Coccidiosis on the Run ..... June, 1949

SHEEP AND GOATS

The Way Animals Graze ..... Aug.-Sept., 1948
Your Sheep may need Cobalt ..... Oct., 1948
The Feeding of Milk Goats ..... Oct., 1948
Man's Best Friend in Greece ..... Oct., 1948
Full-Feed for Lambs ..... Nov., 1948
Sheep Research ..... Jan., 1949
"Elastration" ..... Feb., 1949
Lanolin-Ancient Beauty Aid ..... Feb., 1949
Lambing Time ..... Mar., 1949
Salt and Profitable Sheep Raising ..... Apr., 1949

SOILS

Balance Your Soil Bank Account ..... Jan., 1949
Soil Fertility and Nutrition ..... Feb., 1949
Soil Doctrines ..... Feb., 1949
Soil That Breathes ..... Feb., 1949
Should We Stop Cultivating? ..... Mar., 1949
Legumes Supply Organic Matter ..... Mar., 1949
Physical Structure of Soil ..... Mar., 1949
Our Soils and our Food ..... Apr., 1949
1 in 3,000,000! ..... June, 1949

VEGETABLES

*Sweet Potatoes ..... Jan., 1949
*Spacing Tomatoes ..... Apr., 1949
Radio-Active Planting ..... Apr., 1949
*A fine Squash ..... Apr., 1949
Sweet Potato Bushes ..... May, 1949
Potatoes: Yesterday and Today ..... May, 1949

WEEDS

Chemical Warfare against Weeds ..... Nov., 1948
Control of Wild Garlic & Onions ..... Apr., 1949
Wealth in a Weed ..... Apr., 1949
Chemical Crabgrass Control ..... Apr., 1949

MISCELLANEOUS

Year-Around Stump Treatment ..... Jan., 1949
New Cleaning Materials ..... Feb., 1949
LPG Runs Farm Tractor ..... Feb., 1949
Farmers Under Our Feet ..... Feb., 1949
Is the Bounty System a Farce? ..... Feb., 1949
Rope—Its Uses on the Farm ..... Mar., 1949
Skunk Odor Routs Rats ..... Mar., 1949
Man-Made Weather Miracle ..... Mar., 1949
Vermiculite—Magic Substance ..... Mar., 1949
Kansas Good Will ..... Mar., 1949
Churches That Farm ..... Mar., 1949
Thermometer Stories ..... Apr., 1949
Strong Bones in Old Age ..... Apr., 1949
Research discovers Facts ..... Apr., 1949
This is China ..... May, 1949
Hamsters—A New Industry ..... May, 1949
Barberry Eradication vs. Rust ..... June, 1949
Story of Tal-Wi-Wi ..... June, 1949
Home Weather Station ..... June, 1949
Agriculture and Point 4 ..... June, 1949

* Short Articles.

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The office of government is not to confer happiness but to give men opportunity to work out happiness for themselves.

—William Ellery Channing

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